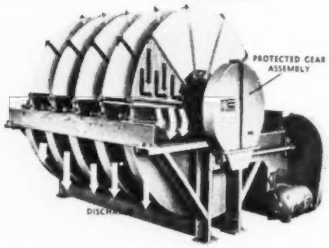
Mining CONGRESS JOURNAL

JANUARY 1957

DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL

One Responsibility

Crushers, Screens, Feeders, Ball-Rod Mills, Classifiers, Jigs, Pumps, Samplers, Agitators, Conditioners, Flotation, Thickeners, Filters, Dryers, Ore Testing and Mill Design Services.



DENVER DISC FILTERS
Give You These Advantages—

- DRIER FILTER CAKE, with positive gravity drainage of filtrate before blow-off.
- LOWER MAINTENANCE COST—all wearing parts are designed for long life.
- LARGER FILTER AREA per unit of floor space.
- WIDE OPERATING FLEXIBILITY—Two or more products can be filtered at the same time.
- Available in sizes from 2' - 1 disc to 9' - 12 disc.
- Drum Filters also available.

WRITE FOR BULLETIN NO. FG-B1.

DENVER High Capacity THICKENER is Completely *AUTOMATIC*

PROBLEM

Today's *new thickening techniques* require a new, high capacity thickener.

New flocculating agents that increase settling rates from 200% to 1000% mean *thickeners must move high tonnage* of fast settling solids and *handle overloads that build up fast.*

Faster settling takes place in less area and permits economy of smaller diameter thickeners.

SOLUTION

Spiral Rakes on DENVER *High Capacity* THICKENERS move solids to discharge in one revolution.

Completely automatic rake control handles overloads without attention and prevents damage to mechanism.

Low cost beam superstructure is used on sizes to 65' diameter. Simplified truss or bridge type is used from 65' to 125'.

COMPARE SPECIFICATIONS—PRICE

Every engineer planning a new thickener installation will want to study DENVER specifications. Compare sand raking capacity; shaft diameter; rugged, heavy-duty construction; totally enclosed, running in oil gears; automatic, foolproof rake lifting controls; acid-proof or standard construction; quick delivery.

You will agree the NEW DENVER *High Capacity* THICKENER more adequately meets ALL requirements of today's new thickening techniques.

"The firm that makes its friends happier, healthier and wealthier"

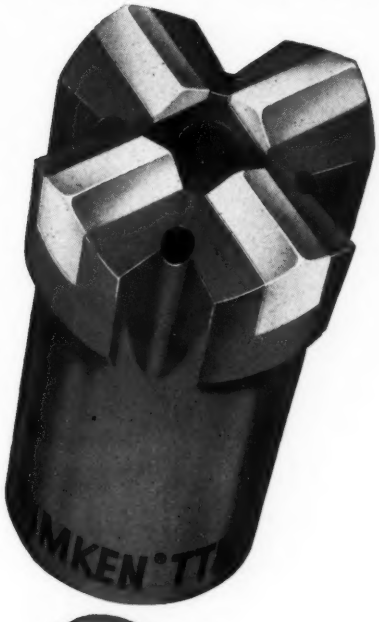
DECO ENGINEER — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

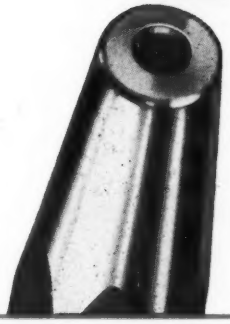
DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado
DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO
MEXICO, D. F. • LONDON • JOHANNESBURG

For air-leg drills and light stoping...

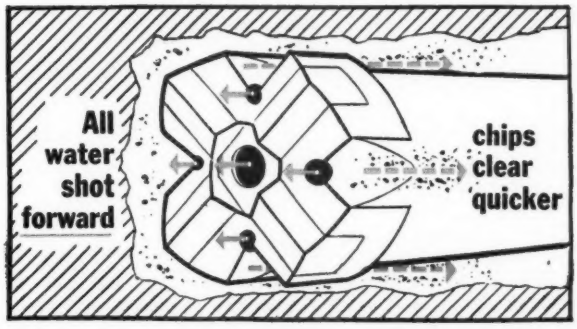
New TIMKEN® removable bit has tapered socket for more secure union





With its uniformly tapered socket, this new Timken® bit provides a more secure union between bit and steel for feed leg drills. And it reduces bit breakage, permits quick and easy bit changes. The bit body is made of special analysis Timken electric furnace fine alloy steel—with the finest in physical properties obtainable in a rock bit today.

Special analysis carbides give the Timken tapered socket bit superior wear-resistance, with added shock-resistance. It holds its gauge longer, drills faster and can be reconditioned many times. Cuts your bit costs on really tough drilling jobs. Comes in three popular sizes: 1¼", 1⅜" and 1½".



New features speed chip removal—Five specially positioned front holes direct water more forcefully against face, wash away chips faster. Deeper, wider clearance between cutting wings works in conjunction with 5 front holes to give speedier removal of washed-back chips. The new features of the Timken tapered socket bit speed drilling, give lower cost per foot-of-hole.

THERE'S A TIMKEN BIT FOR EVERY JOB . . . EVERY DRILLING CONDITION

TIMKEN MULTI-USE BIT

Your most economical bit for ordinary ground. With correct and controlled reconditioning, it gives the lowest cost per foot-of-hole when full increments of steel can be used. And it is interchangeable with Timken threaded carbide insert bits on the same drill steel.

NEW TIMKEN THREADED CARBIDE BIT

For other tough drilling jobs. New design features speed chip removal. 1) five front holes; 2) deeper, wider clearance between wings; 3) deeper undercut under the heel. Improved thread contact reduces breakage. New wear-resistant carbides add life.

The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio
Cable address: "TIMROSCO"

TIMKEN TRADE-MARK REG. U. S. PAT. OFF.

REMOVABLE ROCK BITS

with COLMOL®
an average production of 25 tons per payroll man

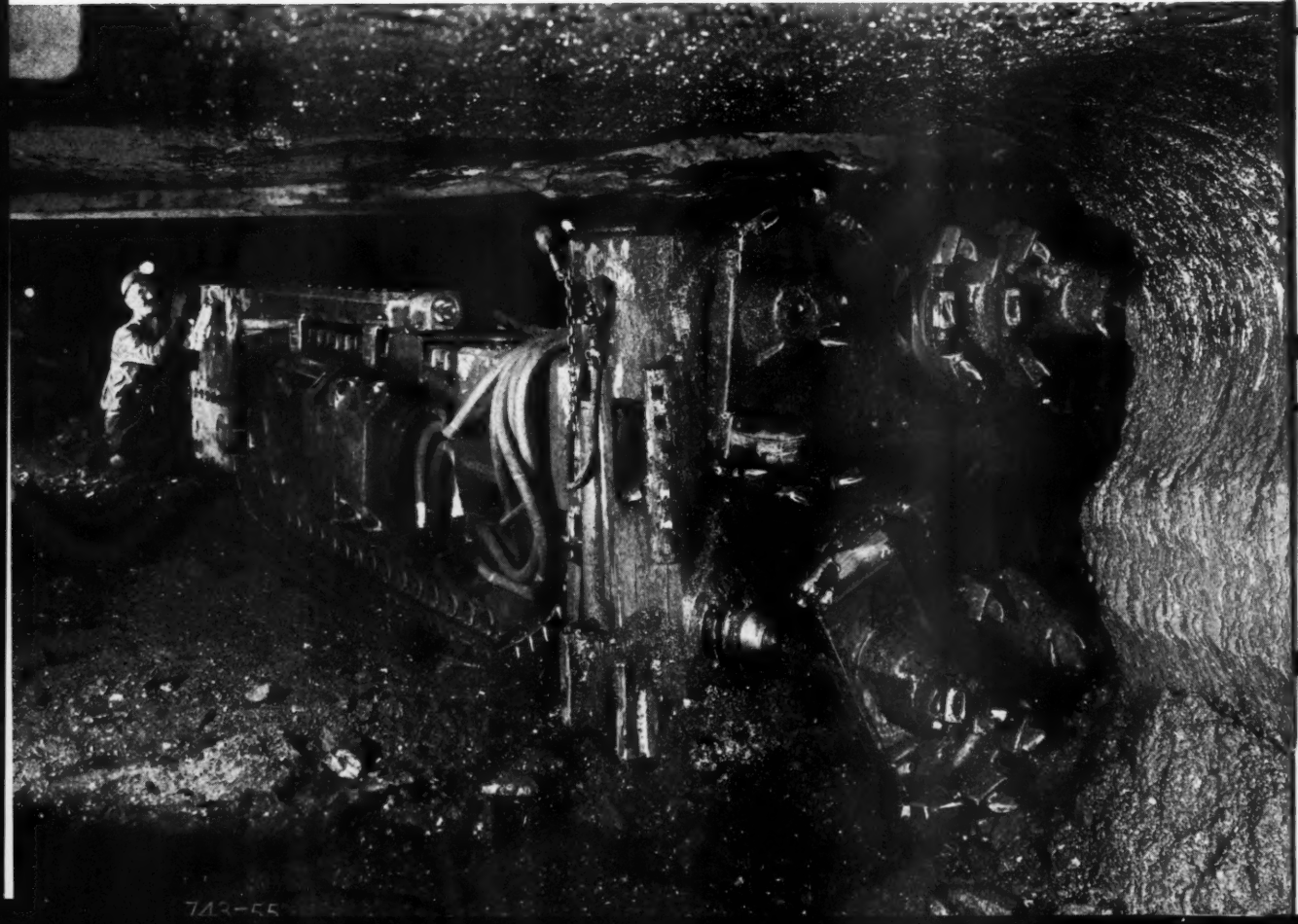
Peck's Run Coal Company, Upshur County, West Virginia, reports after two years' experience with their Colmol:

High average shift tonnages mined at lower cost; 25 tons per man on the payroll.

- Roof support costs were reduced and safety was increased, because no explosives are used.
- Bit costs are very reasonable, even though coal has a medium-hard structure, and sulphur balls and pyrite lenses occur frequently.
- Coal quality is better than obtained by conventional mining methods; ash reduced from 8.7% to 7.0% and sulphur reduced from 3.0% to 2.4%.

Redstone seam, mined since 1917, ranges in height from 50" to 72"; mainly 54" to 68". High ash and high sulphur layers persist throughout the property immediately adjacent to the top and bottom of the seam. Strict supervision of mining keeps these operations in the desirable, narrower coal where the seam is good.

A Jeffrey 76-B Colmol, with a mining range of 50½" to 66", working at Peck's Run.



A 30" Jeffrey 52-B belt conveyor at Peck's Run.

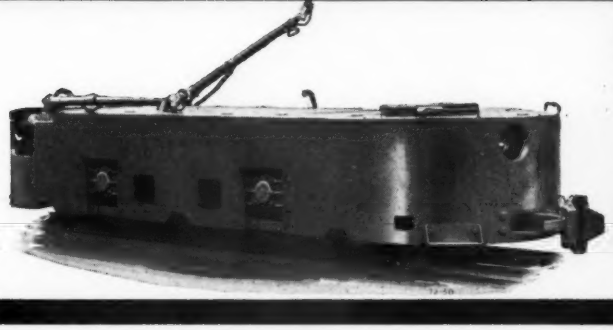
In solid mining, 3 entries are driven on 60′ centers, with a 30" Jeffrey belt conveyor in the center entry. Single panels are developed to left and right at a 60° angle, limited to 5 blocks in depth, 80′ wide by 90′ deep, so the longest haul to the belt is 450′. Places are driven two widths of the Colmol, or 19′ wide.

The resulting pillars, 62′ by 72′, are split through by driving two widths of the Colmol. The remaining two stumps are removed by single width advances of the Colmol, leaving small triangular pillars, which make adequate roof supports, until falls are made. One block gives about 870 tons.

Present operation is three shifts, two of which are full production of about 450 tons average. The third shift mines 100 to 300 tons, since it is principally engaged in inspection, maintenance and lubrication of equipment, supplying and advancing the belt line. They also finish up places that will permit the Colmol to start the next production shift to better advantage.

The three shifts total from 1000 to 1200 tons per day, the entire output of the mine. Single shift production in excess of 600 tons has been obtained with this Jeffrey unit.

A 15-ton Jeffrey trolley locomotive hauls the coal to the tipple in 8-ton, 8-wheel mine cars for picking, crushing, sizing, and loading into railroad cars. A cleaning plant is now under construction at Peck's Run Coal Company.



The Jeffrey Manufacturing Company, Columbus 16, Ohio. District Offices: Beckley, Birmingham, Denver, Evansville, Harlan, Pittsburgh, Salt Lake City.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

JANUARY, 1957

VOLUME 43 • NUMBER 1

Mining

CONGRESS JOURNAL

Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign, $5.00. Single copies, $0.30. February Annual Review Issue, $1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.

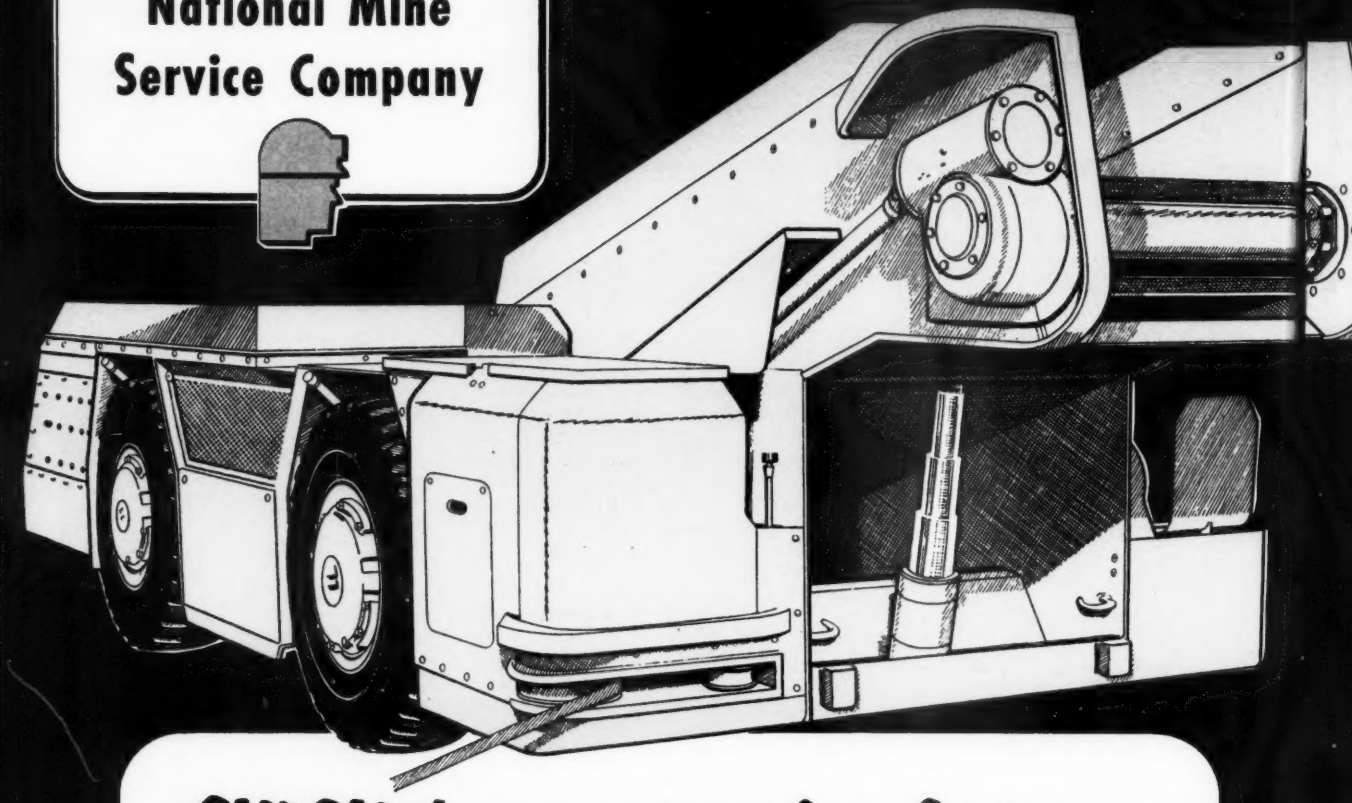
Indexed regularly by Engineering Index, Inc.

CONTENTS

FRONT COVER: The U. S. Bureau of Mines has approved two commercially made lighting systems as permissible for safe use in gassy or dusty coal mines. We agree with Marling J. Ankeny, Bureau Director, who states that these approvals "may bring about one of the greatest advances in mine safety in recent times."

THE AMERICAN MINING CONGRESS
RING BLDG., WASHINGTON 6, D. C.

National Mine Service Company



CHECK these cost-saving features:

Single Motor—Either A. C. or D. C. . . . large capacity . . . fan cooled

Torque Converter—Provides smoother, more flexible operation and drive . . . prevents motor damage should the car stall

Heavy-Duty Interchangeable Wheel Units—Trouble-free gear and pinion type

Four-Wheel Drive and Steering—High maneuverability

Minimum of Electrical Controls—One non-reversing motor powers all drives

Constant Mesh Transmission—Three speeds forward and reverse

New Conveyor Flights—Easily detachable without breaking the chain

Full Hydraulic Pressure for Steering—Even in event of power failure

Time Saving—Boom may be raised while car is moving into position for unloading

Simplified Lubrication—Both automatic and zoned

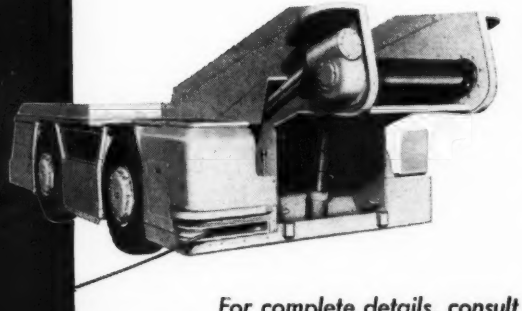
Extra Rugged Frame—Withstands hard usage and abuse

National Mine Service Company

announces its manufacture and exclusive distribution of the new

TORKAR*

A.C. or D.C. powered shuttle car



New performance and maintenance standards for shuttle car operation have been established by these patented cars in over four years of continual use and exhaustive field testing. They embody advanced design and engineering principles never before applied to shuttle car construction.

For complete details, consult your National Mine representative or write:

National Mine Service Company

564 Alcoa Building • Pittsburgh 19, Pennsylvania

All-State Division
Logan, W. Va.

Anthracite Division
Forty Fort, Pa.

Ashland Division
Ashland, Ky.

Bemeco Division
Beckley, W. Va.

Kentucky-Virginia Division
Jenkins, Ky.

Western Kentucky Division
Madisonville, Ky.

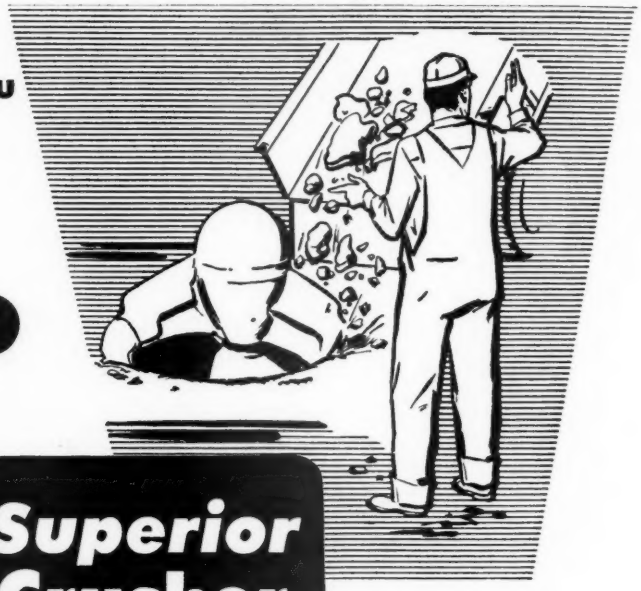
Whiteman Division
Indiana, Pa. Morgantown, W. Va.

*Trademark

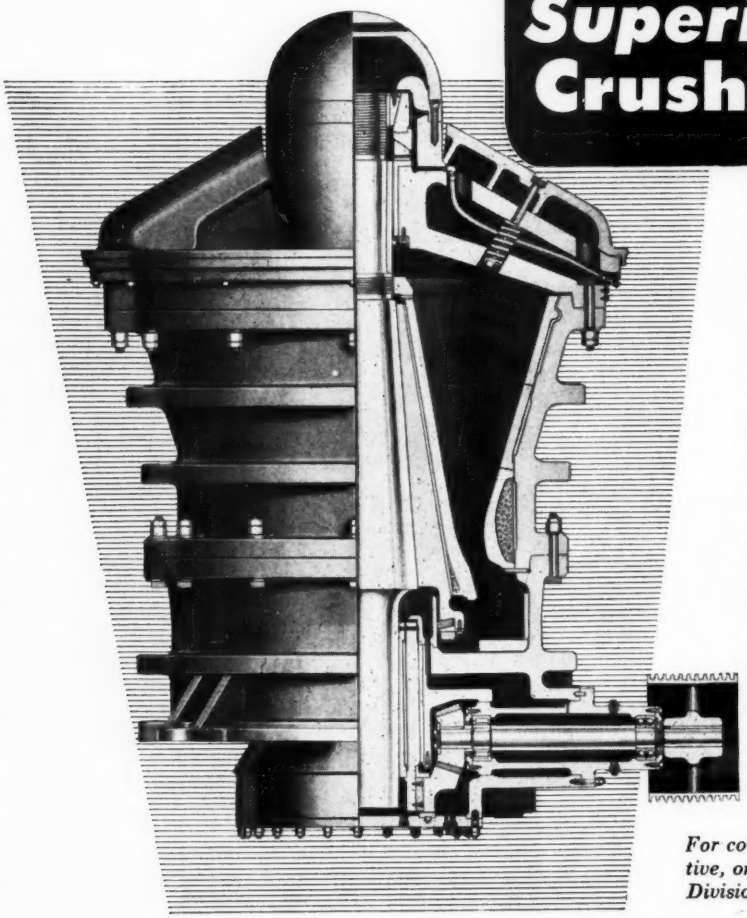
U. S. Bureau of Mines Approved

Only one crusher gives you

Complete Adaptability for a BALANCED CIRCUIT



Superior Crusher



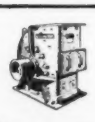
• With a *Superior* gyratory crusher pacing production, your entire circuit remains in balance. Subsequent equipment—crushers, screens, grinding mills — need not be readjusted to varied product sizes and capacities. The many variable factors provided by the *Superior* crusher permit obtaining the kind of production flow demanded by your other equipment. For example, changing eccentric throws, crusher speed or shape of crushing chamber varies capacity and product size. The *bottom discharge* permits utilizing the concrete foundation as a surge bin to control flow of material through your plant.

Hydroset control is another factor in maintaining a balanced circuit. Retaining the initial crusher setting by compensating for wear is a one-man, one-minute operation when a *Superior* gyratory crusher is so equipped. Emergency unloading is made easier with just the flick of a switch. A-4934

For complete information, see your A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis., for Bulletin 07B7870.

Superior and Hydroset are Allis-Chalmers trademarks.

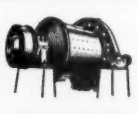
ALLIS-CHALMERS


Hammermills

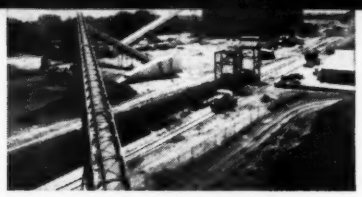

Vibrating Screens


Jaw Crushers


Gyratory Crushers


Grinding Mills


Kilns, Coolers, Dryers



STANOLITH Grease gives coal a smooth ride

Over 5,000 bearings need just one grease. Never a bearing lubrication failure.

Part of the coal for the Wabash River Generating Station operated by the Public Service Co. of Indiana near Terre Haute, comes directly from the Viking Coal Mine Processing Plant via a conveyor system. The system operates 365 days a year moving up to 4,800 tons of coal per day. STANOLITH Grease has been used to lubricate all bearings in the conveyor system since February 3, 1953, the start up day. In all that time there has never been a bearing lubrication failure.

Prior to the initial operation of the conveyor system, maintenance supervisors checked with Paul Manning, Standard Oil industrial lubrication specialist, about lubricating the new installation. Paul, they knew, has extensive experience (21 years) in handling lubrication problems of this kind. Working with plant management, Paul recommended STANOLITH Grease No. 42 for the job. STANOLITH Grease has fulfilled maximum expectations.

STANOLITH Grease is a smooth textured grease. It is made from highest quality oil, lithium soap and special additives. It resists water washing and water contamination. STANOLITH Grease works well in exposed, outdoor installations. It will not channel. It is chemically stable. It can be applied easily by hand, gun or pressure system.

Find out more about STANOLITH Grease. Talk to your Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest or Rocky Mountain states. Or write 910 South Michigan Avenue, Chicago 80, Illinois.

***Quick facts about* STANOLITH Grease**

- Water resistant
- High temperature resistant
- Pumpable in grease gun or pressure system
- Mechanically stable

STANDARD

STANDARD OIL COMPANY
(Indiana)

Part of coal conveyor system at Wabash Power Plant, Terre Haute. Entire conveyor is lubricated with one grease —STANOLITH. No bearing failures experienced during the 3½ years conveyor has operated.

CARDOX

(NON-EXPLOSIVE MINING METHOD)

THESE 223 MINES

Are Now Using

EITHER CARDOX OR AIRDOX MINING METHODS

VIRGINIA

Buchanan County Coal Corporation
H. C. Harman Coal Company
Margaret Ann Coal Corporation
Jewell Ridge Coal Corporation
Panther Coal Company, Inc.
Preston Mining Company
Sunrise Coal Company
Sycamore Coal Corporation
Wallen Coal Company

WEST VIRGINIA

American Coal Company (2)
Ames Mining Company (2)
Boone County Coal Company (2)
Brule Smokeless Coal Company
Carbon Fuel Company
Chafin Coal Company
Clear Creek Coal Company
Crozer Coal and Coke Company
Eastern Gas and Fuel Associates (2)
Elk Lick Coal Company
Ethel Chilton Mines
Gay Coal and Coke Company (2)
Gay Mining Company (2)
Gulf Mining Company
Hoylman Coal Company (3)
Island Creek Coal Company (3)
Imperial Smokeless Coal Company
Jacob's Fork Pocahontas Coal Company
Johnstown Coal & Coke Company (2)
Kimberling Collieries
Lafayette Springs Coal Company
Lake Superior Coal Company
F. M. A. Leach
Lorado Coal Mining Company
L & W Coal Company (2)
Maust Coal & Coke Company
Mt. Hope Coal Company
Nassau Coal Company (3)
New River Company (2)
Olga Coal Company (2)
Omar Mining Company (2)
Pardee and Curtin Lumber Company
Pecks Run Coal Company
Peerless Coal & Coke Company (2)
Peters Creek Coal Company
Pond Creek Pocahontas Coal Company (2)
Premier Pocahontas Collieries
Raine Lumber and Coal Company
Raleigh-Wyoming Mining Company
Royalty Smokeless Coal Company (2)
Slab Fork Coal Company
Tioga Coal Corporation (2)
Truax-Traer Coal Company
Weyanoke Coal and Coke Company
Winding Gulf Collieries (2)

KENTUCKY

Bell & Zoller Coal & Mining Company (2)
Begley & Conley Coal Company
Big Jim Coal Company
Black Star Coal Corporation
Carrie Lou Coal Company
Carrs Fork Coal Company
Cinderella Coal Corporation
Citation Coal Company
Deby Coal Company
W. G. Duncan Coal Company, Inc. (2)
Eastern Coal Corporation
Fed's Creek Coal Company
Field's Branch Coal Company
Fourseam Coal Corporation (2)
Inland Steel Company
Jewell Ridge Coal Corporation (2)
Kentland Elkhorn Coal Company
Kentucky Mountain Coal Company
Knott Coal Corporation
Liberty Coal Company
Lynn Coal Company
Majestic Collieries Company (5)
Mary Gail Coal Company (2)
Smith Coal Company
Stonega Coal Company
West Kentucky Coal Company (2)

TENNESSEE

Block Coal & Coke Company

CARDOX CORPORATION

ANNUAL *Roll Call*

PENNSYLVANIA

The Berwind-White Coal Mining Company
Cambria Clearfield Mining Company
Campbell Coal Company
Johnstown Coal & Coke Company
Mathies Coal Company
Marco Coal Company
Moffitt Coal Company
Morrisdale Coal Mining Company
Ontario Coal Mining Company
Pittsburgh Coal Company.....(5)
Rochester & Pittsburgh Coal Company
Sager Coal Company
Springfield Coal Corporation
Westmoreland Coal Company

OHIO

Clean Coal Company
Columbia Southern Chemical Corporation
Dindo Coal Company, Inc.
The Farm Bureau Cooperative Association Inc.
Gem Coal Company
Hanna Coal Company of Ohio
Jefferson Coal Company
Lorain Coal & Dock Company.....(2)
Merrick Coal Company
Ohio Land & Railway Company
Powhatan Mining Company
Warner Collieries Company

ILLINOIS

B & W Mining Company
Bell & Zoller Coal & Mining Company.....(3)
Belle Valley Coal Company
Blue Bird Coal Company
Blue Blaze Coal Company
Carmac Coal Company
Chicago, Wilmington & Franklin Coal Company
Eddy Coal Company
Elk Coal Company
Freeman Coal Mining Corporation
Lincoln Coal Mining
Mid-Continent Coal Corporation
Old Ben Coal Corporation.....(3)
Parton Coal Company
Peabody Coal Company
Pschirrer & Sons Coal Company
Sahara Coal Company.....(3)
Truax-Traer Coal Company
Union Colliery Company
Wilkins Coal Company

INDIANA

Enoco Collieries Company
Ingle Coal Corporation
Pandora Coal Corporation
Princeton Mining Company
R & H Mining Company
Snow Hill Coal Corporation.....(2)

OKLAHOMA

Reliance Smokeless Coal Company

COLORADO

Bear Coal Company
Black Diamond Fuel Company
Boulder Valley Coal Company
Champion Coal Company
Clark Coal Company.....(2)
Clayton Coal Company.....
Colowyo Coal Company
Dry Creek Coal Company
Golden Quality Coal Company.....(2)
Imperial Coal Company.....
Jenkins & Mathies Coal Company
Juanita Coal & Coke Company
Kerr Coal Company.....(2)
Minerals Development .....
Taylor Coal Company
Thompson Creek Coal & Coke Corporation
Tomahawk Coal Company
Vento Coal Company

MONTANA

Brophy Coal Company
Johnson Coal Company
Mountain State Mining Company
Nies Brothers
Northern Coal Company
Roundup Mining Company
Western Coal Company

WYOMING

Colony Coal Company
Gunn & Quealy Coal Company
Ronocco Coal Company
Storm King Coal Company

UTAH

Independent Coal & Coke Company.....(2)
Lion Coal Company

ARKANSAS

Quality Excelsior Coal Company
Smokeless Coal Company

CANADA

Amalgamated Coals, Ltd.
Century Coal Ltd.
Lethbridge Collieries, Ltd.....(2)
Midland Coal Mining Co.
Red Deer Valley Coal Company, Limited
West Canadian Collieries, Limited.....(2)

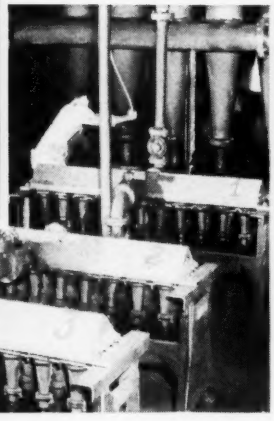
*INDICATES NUMBER OF MINES USING THE NON EXPLOSIVE MINING METHOD

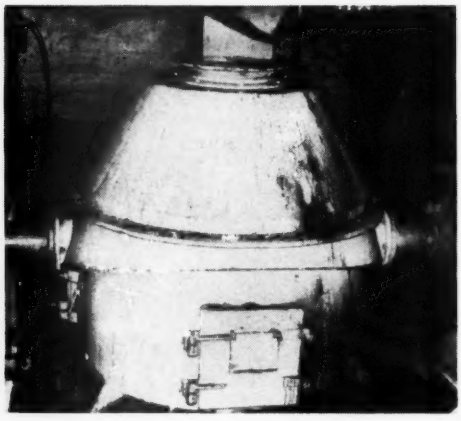
Research ... + H & P CYCLONES + Reineveld Centrifuges

are combined in the

HEYL & PATTERSON CIRCUIT

to produce a scientifically designed Fine Coal Washing and Water Clarification Plant





The H & P Self-Balancing Circuit Offers These Advantages:

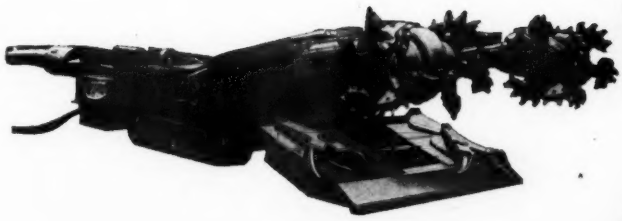
- **Lower initial investment**
- **Lower operating and maintenance cost**
- **100% recovery of all solids reporting from the clean coal discharge of your separating equipment**
- **Closed water circuit operation**

THIS ADDS UP to the most economical fine coal washing and recovery method...the H&P Circuit

Heyl & Patterson
INC.
55 FORT PITT BLVD. • PITTSBURGH 22, PA. • PHONE COurt 1-0750

When efficiency and economy count...count on H&P. Get all the *money-saving facts* from a Heyl & Patterson Sales Engineer

ONLY THE Lee-Norse MINER gives you



"PATTERN CUTTING"

The Lee-Norse Miner cuts a "DIAMOND PATTERN" in the face of the coal by simply revolving and oscillating the cutters at the same time. This is sometimes called "milling the coal off the face."

Every single Cutter Bit follows a right and a left spiral thread which produces the multiple criss-cross kerfs in the face of the coal. The diamond pattern is unique and very *important* because:

1. It cuts more coal with less power.
2. It produces coarse cuttings and less fines.
3. It is a simple and rugged mechanical device.
4. It instantly follows any variation in the thickness of the coal seam.
5. It is the ONLY REALLY NEW cutting tool introduced in recent years.

The Lee-Norse Miner is essentially a modern loading machine plus the most practical device for cutting coal. The Lee-Norse Miner loads all the coal from the floor with improved "dual" gathering arms and a flexible rear conveyor. Excellent clean-up . . . fast tramming.

Lee-Norse Company

CHARLEROI, PA.

DESIGNERS AND BUILDERS OF THE MINE PORTAL BUS

Copper Mining in the Philippines with "Eucs"

Two Rear-Dump Euclids of 22-ton capacity deliver 6000 tons of ore per day to the crusher . . . six others haul overburden to waste areas.

The new Toledo Mine of Atlas Consolidated Mining & Development Corp. on the island of Cebu is the largest open pit copper mine in the Orient. First ore was delivered to the crusher in early 1955 and operations are now being expanded to more than double the original milling capacity.

Atlas selected 22-ton Rear-Dump Euclids to handle the bulk of the overburden and ore hauling. Two of them supply the mill with about 6,000 tons of ore per day, hauling an average of 1600 feet from the loading shovel. Six of the "Eucs" move overburden out of the pit to waste dumps from 1500 ft. to 1½ miles away.

With 300 h.p. diesel engines and Torqmatic Drives, these big Rear-Dumps have plenty of power to move capacity loads over steep grades and tough haul roads. They've kept hauling costs below original estimates and have proved their workability so well that the company is adding eight more 22-ton "Eucs" to the original fleet.

Dependable performance and simple, rugged construction are mighty important considerations when choosing haulage equipment for remote locations like this mine in the Philippines. Excessive down time would seriously curtail production—or even result in a complete shutdown of operations. Have your Euclid dealer show you performance data on mine and quarry work similar to yours and you'll find that ***Euclids are your best investment.***

EUCLID DIVISION, GENERAL MOTORS CORPORATION, Cleveland 17, O.

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

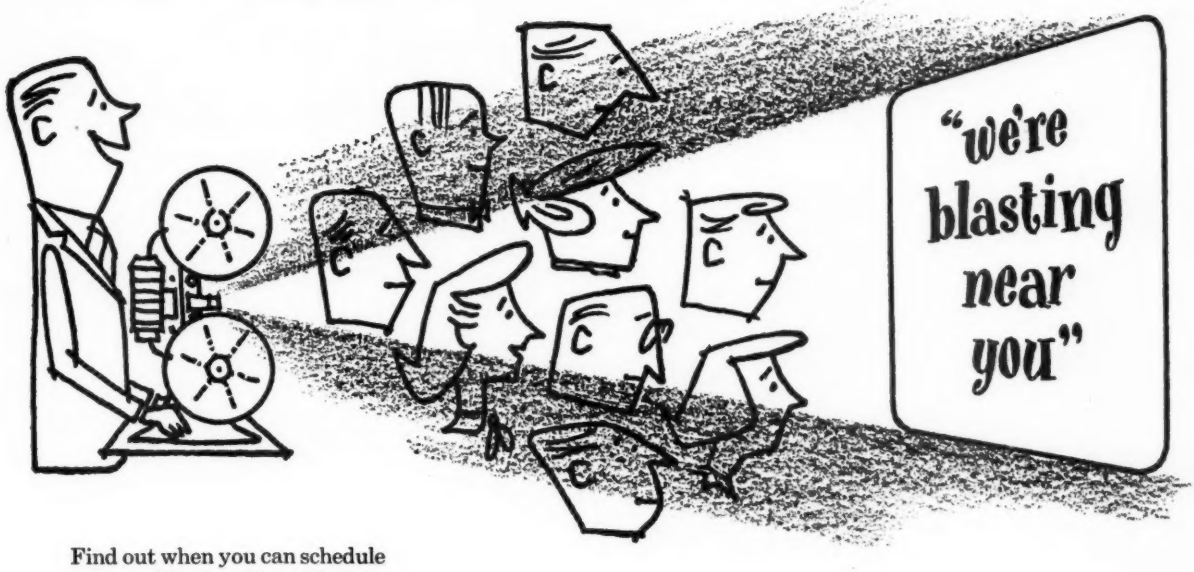
Here's a new, effective way to aid your public relations in the communities where you are blasting. It's the interesting, informative sound film in color, entitled, "*We're Blasting Near You.*"

This movie tells why blasting is necessary, and the steps you are taking to be a "good neighbor." It shows how millisecond delay techniques eliminate the old fashioned, jarring explosions of the past . . . how modern blasting methods hold noise to a muffled minimum and make vibration unnoticeable.

"*We're Blasting Near You*" can be shown to any age group: schools, service clubs, civic organizations. It is accompanied by a kit which includes suggested news releases, a sample introductory speech for the person presenting it as well as safety posters, and other helpful material. Show this unique new movie in your area. It can be an important help to you.

New film...

builds goodwill for users of explosives



Find out when you can schedule "*We're Blasting Near You*" in your community. And ask for "*Better Blasting,*" the Atlas newsletter on latest methods and materials.

Technical Customer Service Section

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

offices in principal cities

the BUCYRUS ERIE 30-B

. . . sets new performance standard in the 1-yd. class

Here's a brand new 1-yd. profit-maker for you — the Bucyrus-Erie **30-B**. Offered with either crawler or rubber-tired carrier mounting, it's readily convertible to various front ends — shovel, dragshovel, dragline, crane, or clamshell.

New . . . fast . . . quality-built, the **30-B** is just what you need in a 1-yd. machine to speed stripping and loading operations. Check the brief rundown of features given below; then request full details.

Matched to your needs

- Your choice of diesel, gasoline, or single-motor electric power. Direct or torque converter drive.
- Five easily-converted front ends — shovel, dragshovel, crane, dragline and clamshell.
- Your choice of five crawler mountings *plus* Transit Crane on rubber-tired carrier.
- Extra equipment for special jobs—independent propel, third drum unit, and cathead.

Designed to out-perform

- Easy, air control for smooth, big-output working cycles.
- Easy to service — automatic lubrication of many parts.
- Large, cool-running clutches and brakes.

Built to outlast

- Six conical hook rollers distribute loads evenly between upper and lower works to save wear.
- Five main operating clutches are alike, with parts interchangeable.
- Specially-processed steels add strength and wear resistance.
- Strong, rigid cast revolving frame withstands twisting and bending stresses, maintains machinery alignment.

199E56C-a

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Gentlemen: Please send me details on the new 30-B.

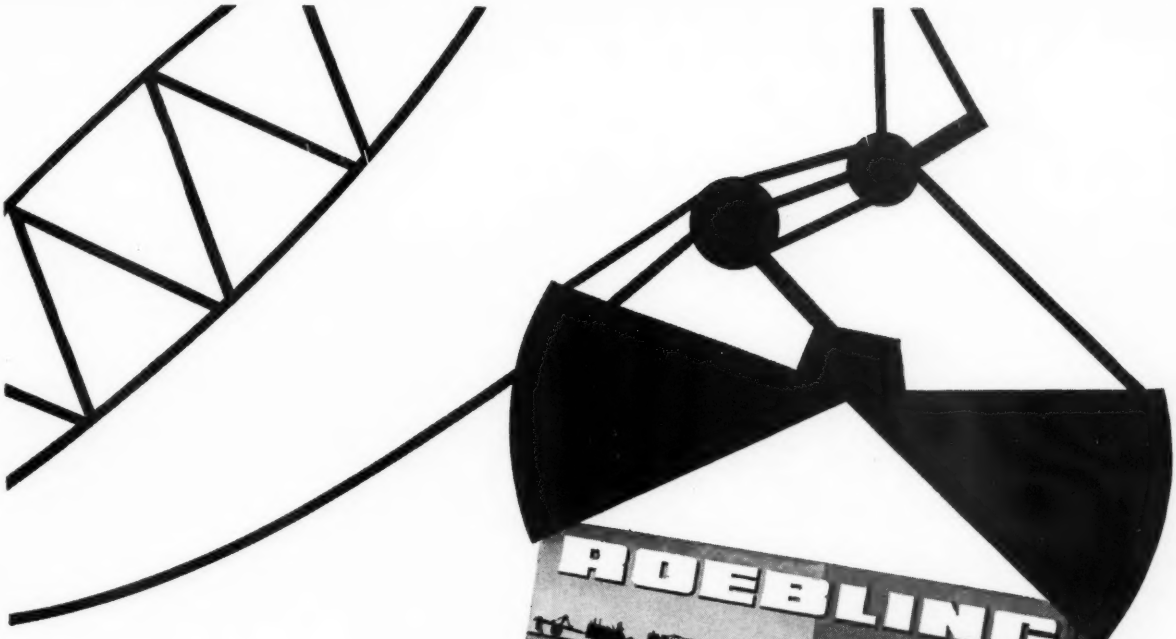
Name _____

Organization _____

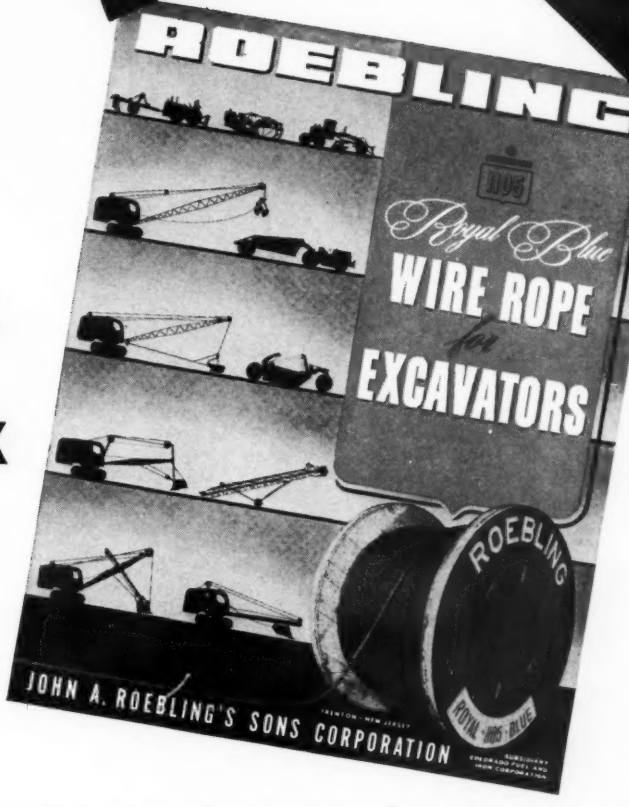
Address _____

City _____ State _____

Send for complete facts NOW!



Ask for Your Copy of This Code Book That Holds No Secrets!



If you operate excavating equipment, Roebling's new booklet, "Wire Rope for Excavators," is a must. It's chock-full of sound recommendations on where to use Royal Blue Wire Rope—the rope that's built to be stronger than the finest grade previously available.

The easy-to-follow coding system assures that you get the right rope every time. It covers hoist ropes, dragline ropes, ropes for shovels, skimmers, scraper wagons, trench hoes, clamshell cranes, slacklines, derricks, drag scrapers and bulldozers. The recommendations are for the rugged conditions you meet every day.

You'll also find supplementary data on wire rope constructions, diameters, weights and breaking strengths.

There is a copy of this 12-page booklet waiting for you. Communicate with John A. Roebling's Sons Corporation, Trenton 2, New Jersey. Your copy will be sent promptly.

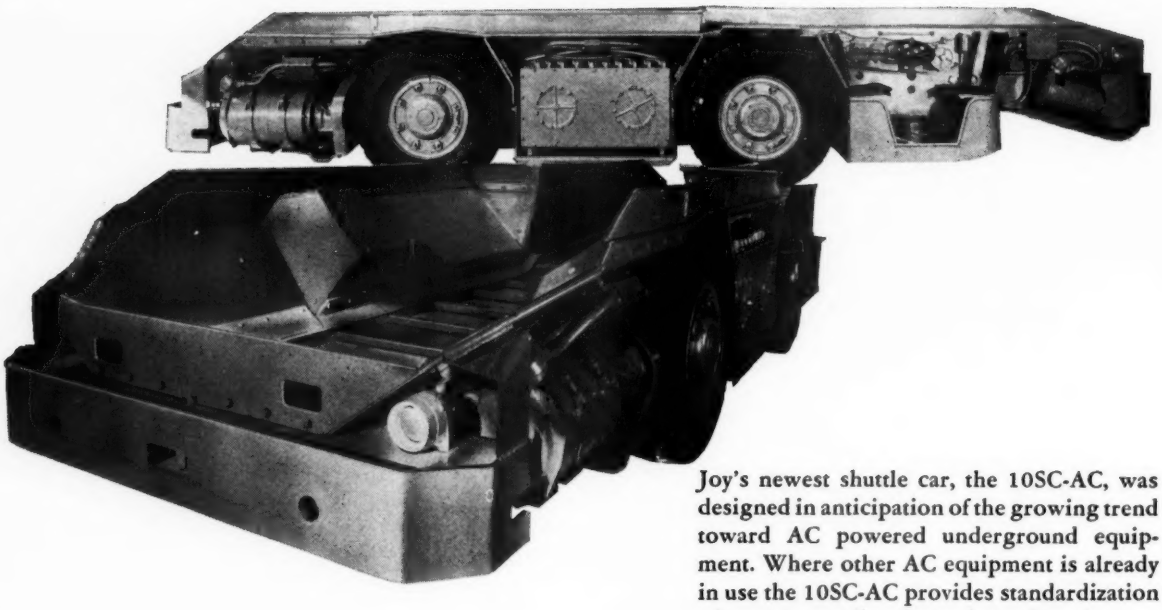
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

A NEW SHUTTLE CAR

the JOY 10SC-AC

IN OPERATION SINCE MID '56



Joy's newest shuttle car, the 10SC-AC, was designed in anticipation of the growing trend toward AC powered underground equipment. Where other AC equipment is already in use the 10SC-AC provides standardization of power supplies throughout the mine . . . makes stocking and purchasing problems simpler. But more important, the 10SC-AC brings the powerful performance and extremely low maintenance of AC motors into the shuttle car field for the first time.

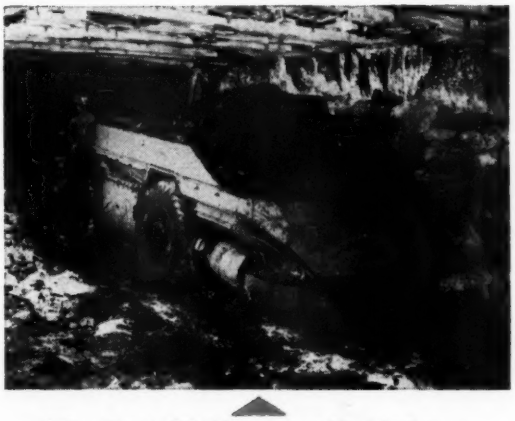
Two constant-horsepower, 2-speed traction motors, rated at 40 horsepower each, drive the car . . . eliminating all clutches, transmissions, and cross-drive shafts. Shifting is done automatically, electrically . . . fewer mechanical parts . . . less maintenance. Two constant-torque, 2-speed conveyor motors, 15 horsepower each, power the conveyor by direct drive without complicated transmission systems or complex gearing. These design features closely follow the proved design of Joy's DC driven car, the 10-SC, operating in the field for almost ten years.

4-wheel drive and 4-wheel steering makes the 10SC-AC extremely maneuverable in closely timbered areas.

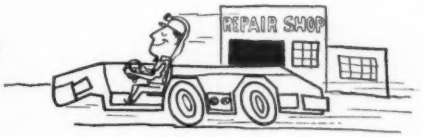
See it at the COAL SHOW

WSW CL 6419-144

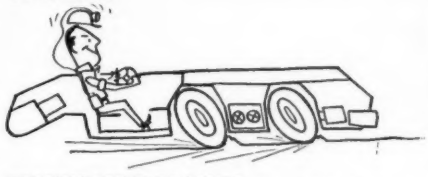
operating on ALTERNATING CURRENT



The Joy 10SC-AC car easily carries 10 tons of material even on rough bottoms.

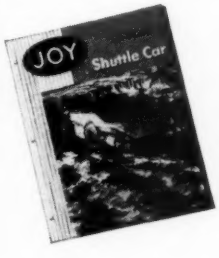


LESS MAINTENANCE—Alternating current motors are trouble free—no servicing of brushes, brush holders and studs . . . not even hand holes on the motors.



REGENERATIVE BRAKING—Standard equipment on the 10SC-AC. On down-grade, braking automatically occurs when motors are driven over their synchronous speeds.

SAME SPEED LOADED OR EMPTY—AC motors power the 10SC-AC at almost the same speed whether loaded or empty . . . keeps several cars on an even cycle . . . eliminates jams and waiting at loading point.



WRITE FOR BULLETIN 144-3

A complete description of the 10SC-AC including dimension drawings, specifications and performance curves.

PROVED PERFORMANCE—The basic design of the car is the Joy 10-SC . . . in the field since 1948. New 10SC-AC's are now working coal.

JOY MANUFACTURING COMPANY, OLIVER BLDG., PITTSBURGH, PA.

EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY

CONTINUOUS MINERS

COAL LOADERS

COAL DRILLS

COAL CUTTERS

NOW—PRECISION-MADE S

Unique Optical Comparator Assures Accurate Qu

As the first to apply the technique of micrometric projection to the manufacture of wire screen cloth, Hewitt-Robins can now meet the most exacting specifications every time. With the use of this Optical Comparator, an unusually high degree of accuracy can be obtained because all measurements and comparisons are made on a greatly enlarged image rather than on the object itself. There is no direct contact with any part nor can there be any deformity caused from measuring pressure.

The actual wire sample is projected on a master chart with such magnification that the operator can instantly see and correct the smallest variation in the specified crimp. As a result, the crimping machine can be adjusted to three decimal places to obtain maximum uniformity of product.

This is one more special Hewitt-Robins technique for assuring you the finest in wire screen cloth for every sizing, separating or screening operation. Hewitt-Robins wire screen cloth is tougher . . . resists extreme abrasion . . . lasts longer. Every piece is tightly woven with precisely accurate openings and will provide you with higher operating efficiency and lowest cost per ton.

Hewitt-Robins screen cloth is obtainable in a wide variety of weaves in plain steel, spring steel, oil-tempered steel, stainless steel and many other alloys . . . is carried in stock in both Super and Gyraloy grades, 3/16" openings and coarser.

INDUSTRIAL DIVISIONS PRODUCTS

INDUSTRIAL HOSE • VIBRATING CONVEYORS
CONVEYOR BELTING • CONVEYOR MACHINERY
VIBRATING SCREENS • DESIGN, MANUFACTURE, ENGINEERING AND ERECTION OF COMPLETE BULK MATERIALS HANDLING SYSTEMS
"JONES" POWER TRANSMISSION EQUIPMENT
"GLIDE RIDE" THE NEW MOVING SIDEWALK

HEWITT-R

STAMFORD, CONN

SCREEN CLOTH

Quality Control

New Optical Comparator for testing the crimp of wire screen cloth compares samples with master chart. Projected image has been magnified 10 times for precision comparison by D. K. Wallace, Superintendent of Hewitt-Robins Square Mesh Department.

HEWITT-ROBINS VIBRATING SCREENS

Hewitt-Robins Vibrating Screens are manufactured in a variety of styles and a wide range of sizes for every need of industry.

GYREX SCREENS

General-purpose, positive-stroke, 4-bearing screen with amazing versatility of application and an unsurpassed record for stamina in service.

STYLES M AND MS VIBREX SCREENS

Full-floating, unbalanced, pulley-type, 2-bearing screen. Offers sharp sizing of a wide variety of materials at low cost.

STYLE J VIBREX SCREENS

General-purpose screen applicable to a wide variety of screening operations. Wide range of sizes for suspended mounting.

STYLE HS HIGH-SPEED VIBREX

For fine screening operations (up to 100-mesh in some cases). Highly effective circle-throw screening action.

ELIPTEX SCREENS

Exclusive 3-way elliptical motion for sharpest sizing and most effective dewatering. Horizontal-operating flat screens.

HI-G SCREENS

Revolutionary new "modified resonance" principle permits larger screens and bigger capacities at less power. Unusually sharp screening action. Can be made in sizes larger than any other vibrating screen on the market.

FOR SERVICE AND INFORMATION ON BELTING AND HOSE CALL YOUR LOCAL HEWITT-ROBINS INDUSTRIAL SUPPLY DISTRIBUTOR LISTED IN THE "YELLOW PAGES"

ROBINS

CONNECTICUT

1

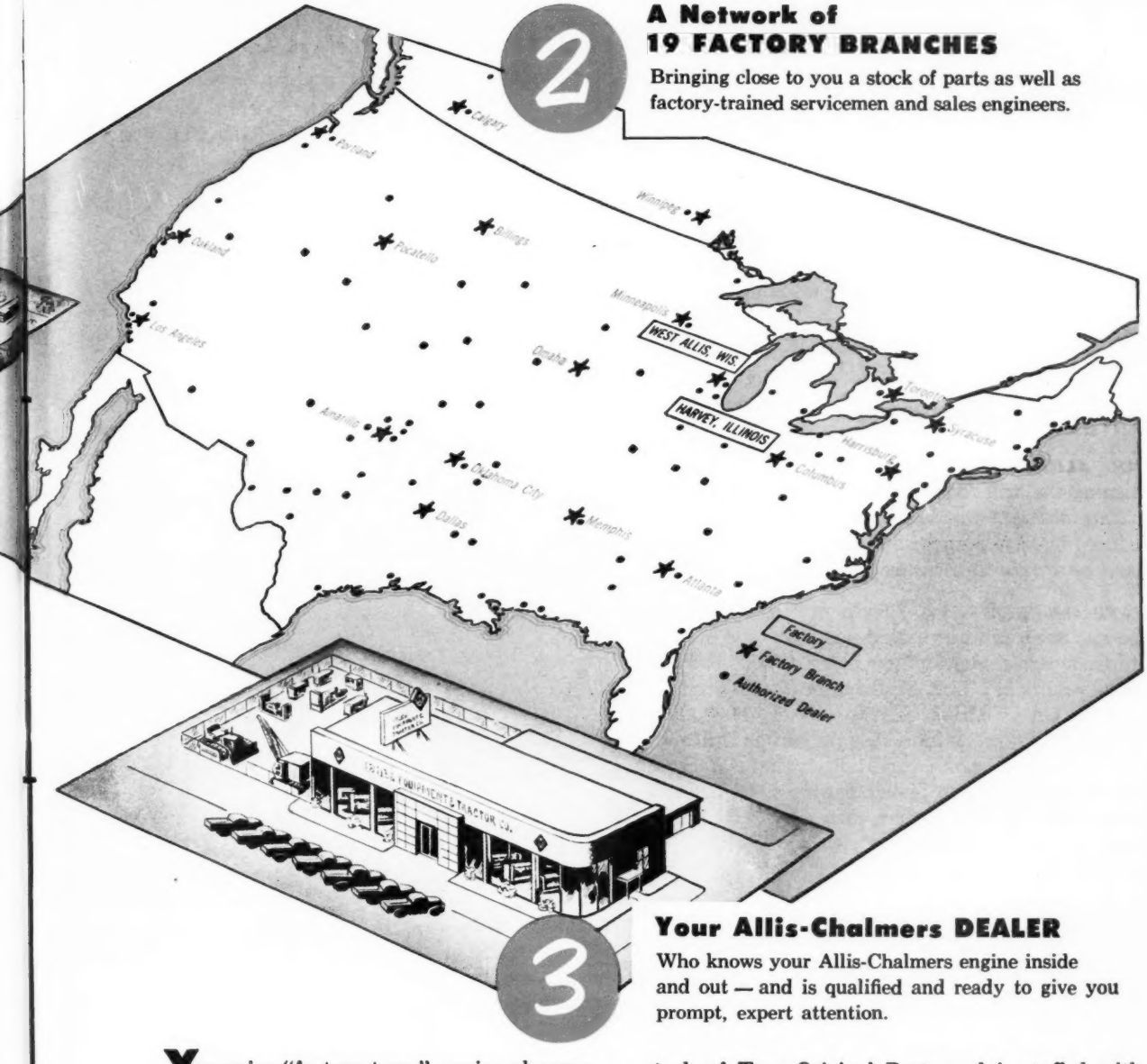
Strategically located FACTORIES

Stocking True Original Parts for continued TOP performance of your Allis-Chalmers engines.

YOU are backed up

3 deep

with parts and service...when you use ALLIS-CHALMERS engines!



You enjoy "factory-town" service wherever you are when you operate Allis-Chalmers engines — for you are backed up *3 deep* by Allis-Chalmers' proven dealer-branch-factory system.

What does this mean? It means that your dealer is serviced from one of *19* nearby factory branches—or direct from the factory. Each branch carries a stock of True Original Parts and is staffed with factory-trained servicemen as well as sales engineers. This assures prompt attention whether you need a replacement part or technical assistance.

Ask your Allis-Chalmers engine dealer to show you how this *3-deep* service can help on your specific engine needs. Write for literature and details.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

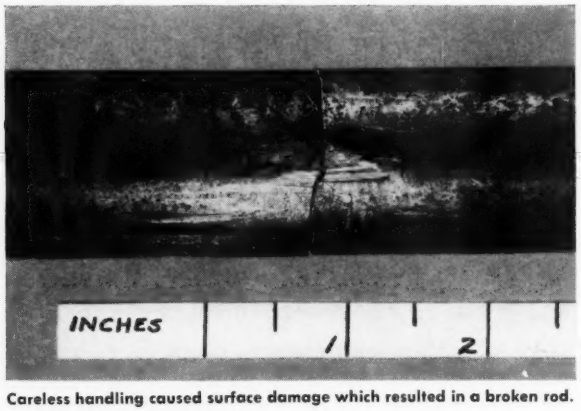
how to get the most out of HOLLOW DRILL RODS

In a modern jackhammer, hollow drill rods must take between 1800 and 2000 jolting blows per minute. It's pretty rugged treatment for *any* steel – even Crucible's special alloy CA DOUBLE DIAMOND or 4E Hollow Drill Rods. That's why it's so important that you prevent unnecessary *abuse* of drill rods on the job. Here are a few tips that may save you time and money.

Take, for example,
DRILLING METHODS

ROD ALIGNMENT – A little extra care in properly aligning the drill rod so that the force of the piston is transmitted to the rock in a straight line will help reduce breakage a surprising amount. For bad alignment sets up severe stresses in the steel.

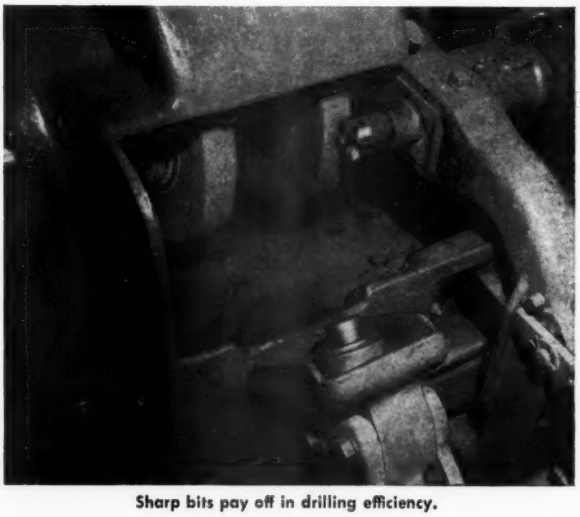
RATE OF FEED – Too slow a rate of feed forces the rod to absorb much of the impact – without a proportionate amount of hole being drilled. Too fast a rate results in a high breakage rate. Alloy rods – Crucible CA DOUBLE DIAMOND or 4E – allow faster drilling speeds than straight carbon drill rods used under the same conditions. That's because these alloy rods have higher hardness, tensile and yield strengths. The harder, more elastic alloy rod transmits the piston blow more efficiently than does the straight carbon drill rod.



Careless handling caused surface damage which resulted in a broken rod.

SURFACE DAMAGE – Damage to the surface of a drill rod may often lead to a broken rod. Nicks or deep tool marks cause stress concentration at the damaged spot.

BITS – Drilling with bits that have dull edges or gages badly worn creates a strain in the drill rod that prevents maximum efficiency. It pays big dividends to keep bits in good shape.



Sharp bits pay off in drilling efficiency.

Actually, the solution to lower drilling costs–longer drill life–is simple: First, use the *right* drill rod and, second, apply a little extra care and common sense to machine setup and operation. It's well worth the effort.

Your nearby Crucible representative can give you helpful hints on other phases of drill rod care and operation–or arrange for *prompt* delivery of hollow drill rods in the sizes, types and grades you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

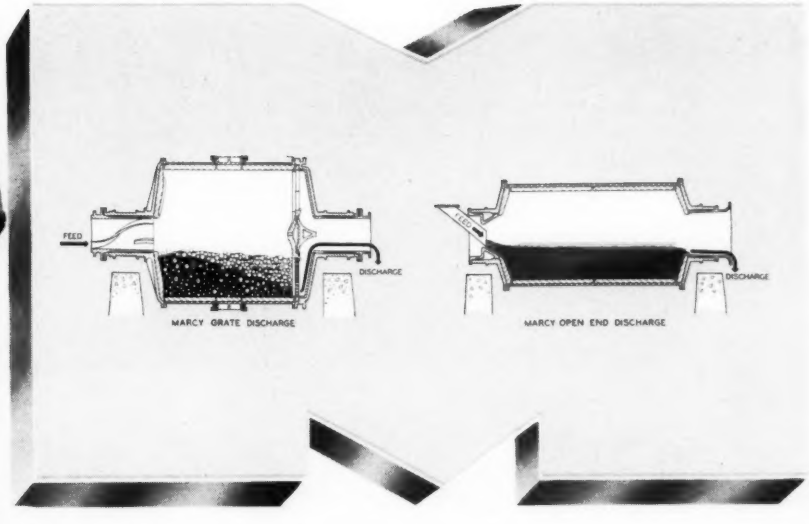
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

see what Marcy can do for YOU!

MARCY PRINCIPLE OF GRINDING INCREASES TONNAGE UP TO 33%

"Rapid change of mill content is necessary for high efficiency"... that's the Marcy principle of grinding. It is accomplished by use of **full-grate** discharge on Marcy Ball Mills and the **open-end** feature on Marcy Rod Mills



This results in a low pulp line which...

- eliminates wasteful cushioning action of high pulp level.
- provides an active, effective grinding mass to work on particle size reduction only.
- results in faster migration of fines than oversize particles, thus less overgrinding.

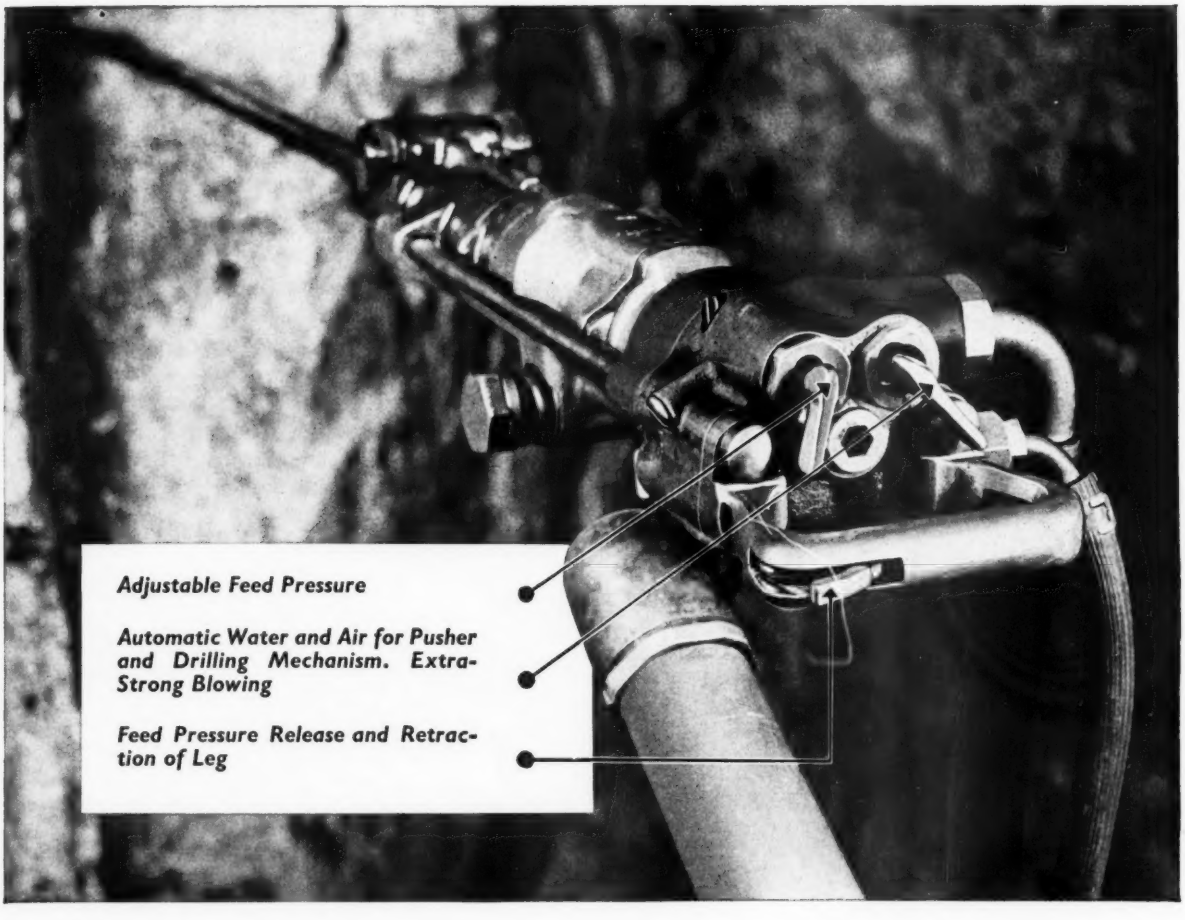
In seven representative installations where overflow mills were converted to Marcy Grates the average increase in tonnage was 33.6% with an average decrease in power of 0.95 KWH per ton.

NO EXTRA CHARGE FOR MARCY EXPERIENCE

THE MINE AND SMELTER SUPPLY CO.

DENVER NEW YORK SALT LAKE CITY EL PASO

SALES AGENTS AND LICENSED MANUFACTURERS THROUGHOUT THE WORLD



RETRACTABLE LEG AND ONE-HAND GRIP-CONTROLS SPEED DRILLING TIME

For years Atlas Copco have been the world's largest manufacturers of pusher leg drills. Since 1937 when Atlas Copco, far ahead of any other manufacturer, introduced their first pusher leg drills, they have continuously improved the design of these drills. Their latest development, the Atlas Copco 'Lion', combines an unequalled ease of operation together with a high drilling rate—both contributing to a higher footage per manshift.

All controls under one hand

The Atlas Copco Lion is the first drill to have all the valves which operate the drill under the control of one hand. *Full control without having to move the hand from the backhead!*

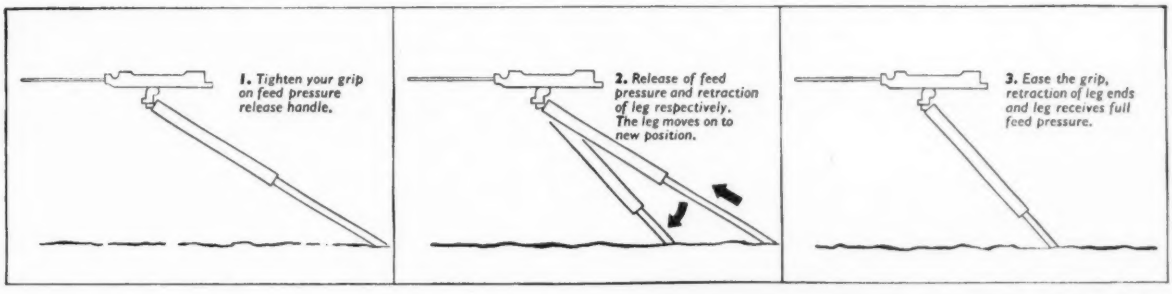
The valves are all easy to operate. By the use of only the fingertips the drill can be started or shut off, the feed can be adjusted to the pressure required, or retracted for an advance, and the extra air-blowing can be brought on to clean the holes.

All the control handles have been designed in such a way that they are well protected. While using them the operator's hand is never near the wall or roof of the drift. The Lion is the first pusher leg drill with controls placed for drifting.

Retractable leg saves time

When the leg has to be moved the feed pressure is easily released by squeezing the hand grip. By further pressure on the grip the leg retracts automatically.

Pusher leg moves forward with drill in full action



When the leg is in the new position suitable for continuous drilling, retraction stops and the feed pressure comes back by loosening the grip of the hand. *All this can be done while the drill is still running.*

This new idea of a retractable leg enables quicker repositioning of the leg and reduces the number of steel changes, thereby increasing footage per manshift. When drilling high holes it is now far easier to alter the position of the leg more frequently in order to maintain an optimal feed angle and feed pressure.

Packed with power for deep holes

The Lion has a drilling rate at least 30% higher than other rock drills of the same weight. Furthermore, it is designed so that it can maintain its high speed *even when drilling deep holes.* This means quickly drilled deep hole rounds and a faster, steadier advance. You'll also find that the Lion reduces *to a minimum* the gauge wear of the bits in abrasive rock. And owing to the ease with which the feed pressure is released and brought back into action, the Lion is a *handier* drill to work with in fissured rock.

Sandvik Coromant—the right steel for the Lion

All Atlas Copco drills—and this goes for the Lion—have been developed from the earliest stages with Sandvik Coromant tungsten-carbide-tipped integral steels and detachable bits. No drill or steel developed separately could ever give such equivalently high performances as this drilling combination. It is today the most widely used in the world, responsible for drilling more than one billion feet per year.

Free Demonstration! *Wire, 'phone or write* today *to any one of these offices and see the Atlas Copco Lion in action for yourself.*

U.S., Atlas Copco Pacific, Inc., 930 Brittan Avenue, San Carlos, California. Atlas Copco Eastern, Inc, P.O. Box 2568, Paterson 25, N.J.

CANADA, Atlas Copco Canada Ltd., Montreal Airport, P.Q.

MEXICO, Atlas Copco Mexicana S.A., Apartado 56, Torreon, Coahuila.

The ATLAS COPCO GROUP puts compressed air to work for the world. It is the largest group of companies specializing solely in the development and manufacture of compressed air equipment. It embraces Atlas Copco companies or agents manufacturing or selling and servicing Atlas Copco equipment in ninety countries throughout the world.

Without changing the grip of the hand the driller can easily position and control the machine, saving time and reducing fatigue.

Atlas Copco

DS61

Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment

Amsco Alloy Ball and Rod Mill Liners

For longer mill life specify AMSCO®
BALL AND ROD MILL LINERS

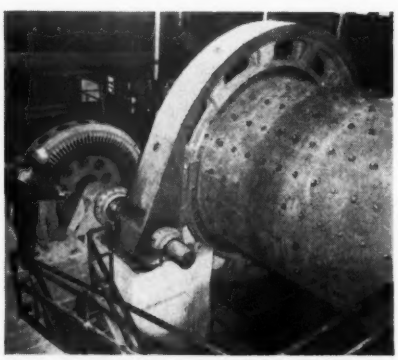
Processing iron ore, copper ore and cement mill clinkers gives a real workout to ball or rod mill parts

For top grinding efficiency, liners of numerous designs found in many leading makes of ball and rod mills are cast from special Amsco Alloy steels. These wear-tough steels are specially engineered to give the highest resistance to wear from abrasion and impact.

Amsco engineers and metallurgists have long co-operated with the manufacturers of ball and rod mill equipment to provide the right wear-resistant liner alloys and the advanced design features that will insure top mill performance.

If you have a problem with fast-wearing and costly mill liners, Amsco can recommend the right solution for you... in either special alloys or manganese steel.

Why not contact your ball or rod mill manufacturer's representative today and inquire about longer wearing Amsco Ball or Rod Mill Liners?



Standard Allis-Chalmers diaphragm ball mill equipped with Amsco Alloy Liners.

AMERICAN Brake Shoe COMPANY

AMSCO

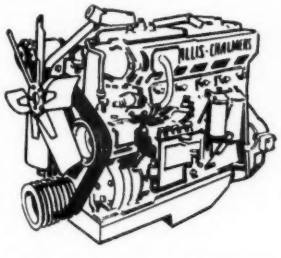
American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS; JOLIETTE, QUEBEC

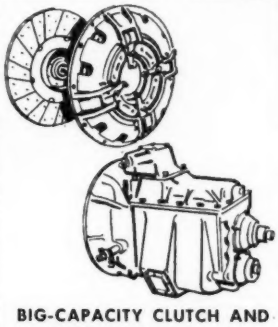
Look at the EXTRA WORK OUTPUT

the Allis-Chalmers TS-360 Motor Scraper gives you

Here are some of the design features that put the TS-360 way out in front in steady performance, dependability and length of service life.

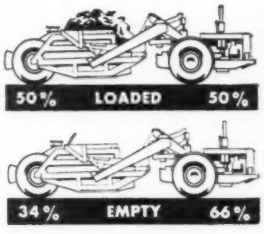


MORE USABLE HORSEPOWER. Allis-Chalmers diesel engine delivers 280 hp — 18.66 hp for each struck yard. This power gets the TS-360 away from the pusher fast . . . gives you speedier cycles, more trips per hour. In this engine, follow-through combustion holds effective working pressures to take advantage of better crankshaft leverage.

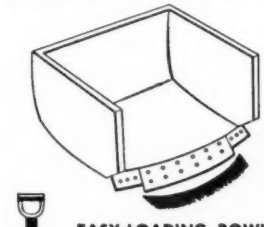


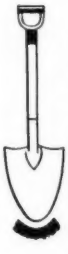
BIG-CAPACITY CLUTCH AND TRANSMISSION give fast, smooth operation under all job conditions. Clutch has air-actuated booster to reduce clutching effort and increase shifting efficiency. The heavy-duty transmission gives unmatched torque output in each gear range.

EXTRA-HEAVY FINAL DRIVES feature rugged differential assembly, carrier-housed drive shafts, final drive gears supported by large roller bearings and heat-treated drive axles. This long-life power train transmits maximum engine output for extra work volume, extra profit.

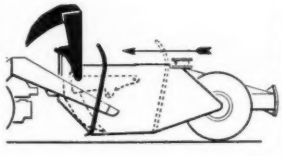


EXTRA TRACTION. The TS-360 motor scraper provides greater tractive effort, loading or traveling. Two-thirds of the empty weight is carried on drive wheels. Loaded weight is distributed equally between tractor and scraper wheels for better balance, increased flotation, safer hauling.

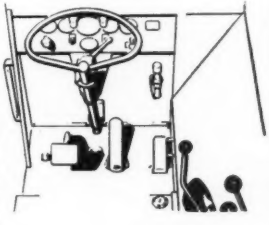




EASY-LOADING BOWL. Wide, low bowl design with curved bottom and offset cutting edge assures full capacity loads in less time. Curved bowl bottom "boils" dirt in, filling corners, heaping load with less spillage.



CONTROLLED DUMPING ACTION. Forward movement of ejector forces out load. High apron lift prevents material from jamming. This combination provides a continuous flow of material for a smooth, even spread.



POSITIVE STEERING. Two-stage selective power steering makes the operator's job easy . . . provides safe, feather-touch response and full maneuverability whether traveling at high speeds or in cut or fill.

OPERATOR CONVENIENCES add to production, too. Easy-to-reach controls, full visibility, four-wheel air brakes, roomy platform, comfortable air-foam seat are some of the features that help operator get maximum output from the TS-360.

More and more TS-360's are coming into your area every day. Ask your Allis-Chalmers construction machinery dealer where you can see them in action. Remember, too — your Allis-Chalmers dealer stocks True Original Parts and offers factory-approved service methods and factory-trained servicemen for your convenience.

ALLIS-CHALMERS CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

Pa. company switches to Du Pont NITRAMITE®— saves 10% on shooting cost alone

SAVES ALSO ON HANDLING AND LOADING—AND WORK IS SAFER

1. "Nitramite" blasting agent goes into 60′ hole at one of Shawsville Mining Co.'s bituminous pits near Clearfield, Pa. "We started using 'Nitramite' nearly a year ago," says Genl. Supt. James Hudson, "and it's cut our explosives bill a full 10%." But this saving's only part of the story.

2. "Nitramite" Primer going into the hole. "Nitramite" cannot be accidentally exploded by rifle bullets, shock, friction or blasting caps. It should be detonated by insensitive "Nitramite" Primers which, in turn, must be initiated with Primacord. This gives you safer blasting.

3. After loading and stemming the hole, workman ties branch line of Primacord to trunk line. Sand-rock overburden ranges up to 40′—yet "Nitramite" breaks the rock even in the toughest formations, and handling's easier, loading safer because it cannot cause headaches.

4. "Breakage is good even when we're shooting 7-8 cu. yards per lb. of 'Nitramite,'" Mr. Hudson adds—and the shot proves his point. Thanks to this Du Pont "team," Shawsville Mining removes about 2,500 tons daily from seams once considered unprofitable—and costs are at rock bottom.

Save when you buy, when you handle, when you load—use Du Pont "Nitramite" blasting agent. It's a product you can load today and shoot tomorrow—and it adds a new dimension in safety. For complete details, contact our representative or write: E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT
BLASTING AGENTS
Products of Du Pont Explosives Research

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

MARIONS IN ZINC

In barren northwestern Quebec—where winter temperatures sometimes drop to 50° below zero and where heavy rains impede work in spring and fall—a team of electrically-powered 4-yard Marion 111-M shovels steadily digs away in a zinc mine. One machine loads an average of 6,000 tons of shot waste rock per 24-hour work day; the other loads an average of 4,800 tons of zinc ore during the same period.

MARION POWER SHOVEL COMPANY • MARION, OHIO

Use KENNAMETAL* Rotary Drill Bits

there is a style and bit size for every drilling operation

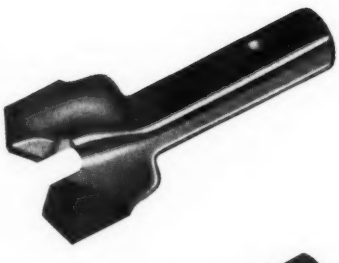
Special grade carbide and effective bit design combine in Kennametal Drill Bits to assure fast drilling and long service life. Their smooth cutting action reduces maintenance costs for bits and drilling equipment, and lowers power consumption. Kennametal's complete line provides the right bit for every drilling condition.

STYLE D BITS

are for drilling coal and rock under widely varying conditions.

STYLE DK BITS

with strong, short prongs and large Kennametal tips, are for drilling in tough formations.



STYLE DB BITS

with hexagonal shanks, are recommended for larger, mounted-type drilling machines and for drilling holes for various blasting devices.

STYLE DL BITS

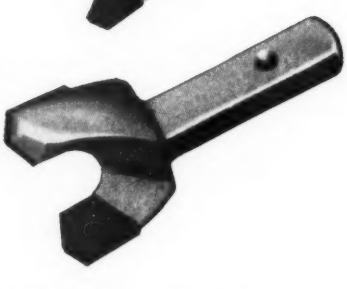
are for faster drilling seams comparatively free of impurities, especially in more brittle coal formations where coring is unlikely.

STYLE DC BITS

with core breakers, are for drilling "mother" coal or other soft materials where cores are frequently formed.

STYLE RD BITS

have short prongs for drilling slate, shale and coal with many impurities.



All styles are available in many different sizes to meet different drilling conditions and penetration requirements.

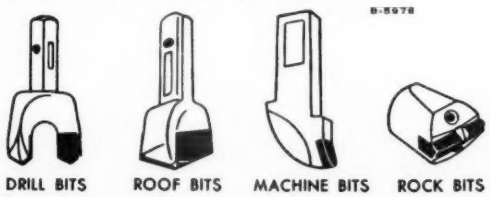
Your Kennametal representative will gladly show you these versatile, economical drilling bits. Let him help you select the right one for each drilling operation. KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

Ask about Kennametal Cutter Bits, Roof Bits, Drill Bits, Augers, Pinning Rods, Accessories.

*Trademark

B-5078

INDUSTRY AND KENNAMETAL ...Partners in Progress



DRILL BITS ROOF BITS MACHINE BITS ROCK BITS

★ Mining CONGRESS JOURNAL ★

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
ROBERT W. VAN EVERA, Editor

Volume 43 JANUARY, 1957 Number 1

Respectability Reinstated

AT the Annual Membership Meeting of the American Mining Congress last month, Felix Wormser, Assistant Secretary of the Interior, pointed out that our country has a President who believes in capitalism. Because there has been in past years a determined and quite successful effort to attach a derogatory connotation to the word *capital*, it seems to require political fortitude to acknowledge a personal belief in it. As all Americans are capitalists, at least to the extent that they own a share in the biggest financial enterprise on earth, the United States Government, it was certainly self-condemning — even all-condemning—to degrade everything having to do with capital.

In the same vein, a monthly bulletin of the Chamber of Commerce of the United States, *Economic Intelligence*, published an article "The Conservative Trend" which states that, "Being a conservative is once again respectable." The term *conservative* has been twisted to imply that all its adherents think everything from the past is good, and that change should be resisted. Actually, conservatives stand strongly for progress, but realizing that change-for-the-sake-of-change is often disastrously wasteful, they advocate the exercise of cautious planning, research and evaluation to make sure that a contemplated change is in fact progressive.

We resent the sort of editorialism and political haranguing that tries to confuse an issue through the use of misplaced epithets, and we are pleased to find that people today are applying more rational meaning to such terms as *capitalist* and *conservative*.

Best Served Are Those Who Serve

A REPORT on the work of the Coal Division Committees appears on page 73 to 79 of this issue. Although the value of this work is apparent to those directly concerned with it, we sometimes wonder if the whole industry appreciates just how successful this program has been.

The Coal Division was organized in the early thirties following a decade of experimentation with mechanical mining methods. At that time about 11 percent of the total production came from mechanized operations. The industry had definitely started on the road to complete mechanization.

Those engaged in the new development were aware that traditional methods would need complete revision. Practices and equipment suitable for hand operation would not fit into a mechanization program. But the development of new equipment and new practices was too big a job for one company or even for a number of companies working separately. There were too many problems to solve.

The AMC Coal Division came into the picture at this point to enlist the cooperation so essential to getting the job done and to coordinate the efforts of operators and manufacturers in the development of new methods and equipment—thus pooling their knowledge and experience for the benefit of the industry. To accomplish this the Division set out with the objective, "to investigate and report on new methods and practices, their degree of success and the class of mines and conditions to which they applied—to learn what methods have proved the most successful and what factors have been responsible for the results obtained."

About four hundred men, guided by an Advisory Council composed of top executives of operating companies, serve on committees, subcommittees and task groups of the Coal Division. Studies of the various phases of mining and preparation are conducted on a continuing basis by these groups of practical mining men — supervisors, engineers, consultants, and equipment designers. Committee membership is about equally divided between representatives of mining companies and of equipment manufacturers.

Each group studies and reports on some specific phase of mining in which new developments are in progress. Over the years MINING CONGRESS JOURNAL publishes these timely and important reports. Thus the industry receives information on the latest technical advances directly from the field.

Each committee report is an authoritative account of a method or type of equipment, showing where it is being used, the conditions for which it is suited and the results that have been obtained. The reports include sufficient detail so that the operator can make a fairly accurate estimate as to whether a method or unit of equipment is applicable under his own conditions. The purpose is not to "sell" but rather to prepare factual, unbiased accounts that will be of practical value to an operator or a manufacturer.

The work of the Coal Division over the years has become recognized by the industry as a definite factor in promoting improved mining methods, higher operating efficiency and greater safety. While no figures are available, there is no doubt that coal companies, through the committee reports, have saved much time, effort and expenditure by using the experiences of others in making their own plans.

The greatest benefit of this valuable work has gone to those who put the most into it. With such a system of automatic reward, the committee workers are not asking for thanks—regardless of the great debt which the industry owes them.

The extensible belt in operation provides an intermediate haulage system as near to continuous haulage as is possible with present day mechanical equipment

Continuous Mining with Extensible Belts

Since 1951 the yearly tonnage mined by continuous miner-extensible belt units has more than tripled. Here is one mine's experience with this new transportation method that cuts labor and operating costs

By MICHAEL YONKO

General Manager
The Powhatan Mining Co.

FROM the very beginning, we must admit that the coal industry was not conceived, planned and blue printed by scientific supermen fully equipped to visualize and engineer perfect mining techniques for all variations in conditions. The coal industry, like other mineral industries, has evolved through the efforts of practical men as the uses for coal have been learned and the demand for it has grown. Men with initiative and vision have prospected for coal, developed mines which employ many thousands of men and have continually sought better methods of mining through the application of the best available mechanical equipment.

Over 65 years have passed since the inception of the first undercutting machines. Punch type cutting units were first developed; then the breast and shortwall machines evolved. In the early years all the coal was hand-loaded. Later shearing machines and mechanical loading units were developed and introduced into the coal fields. This created the need for new and different face haulage facilities, resulting in the development of chain conveyors and shuttle car haulage equipment.

During the last five years the coal industry has been applying on a large scale continuous mining machines that literally tear the coal from the earth without undercutting, drilling or blasting. As experienced in earlier years, a change in mechanical mining methods at the face requires a new and different type of haulage to utilize the full capacity of the face equipment. The latest innovation is the extensible belt which permits a continuous flow of coal without interruption.

Introduces New Problems

With the advent of continuous mining in eastern Ohio, many problems evolved that were not present with conventional mining. Our first problem was the resistance to accept new machinery and try new ideas on the part of the personnel. This resistance is found to some extent at all operating levels. The general attitude of the employe to accept new machinery is, and may well continue to be, one of reserve and skepticism. It is noteworthy therefore that the introduction of continuous mining has not meant that all of our problems have been solved. We have found that it is necessary that our thinking be changed to permit new methods of mining to be introduced, as well as new methods of transporting the coal, so that we can have a continuous flow of coal at all times. We have found that the attitude of different levels of management must be such that they inspire the employe to the point that efficiency in continuous mining is brought about by teamwork and a

realization that no machine is more efficient than the crew that operates it.

The ensuing discussion of continuous mining and extensible belts will be limited to operational experience obtained at the No. 3 mine of The Powhatan Mining Co., located at Dilles Bottom, Ohio, in the Pittsburgh No. 8 seam.

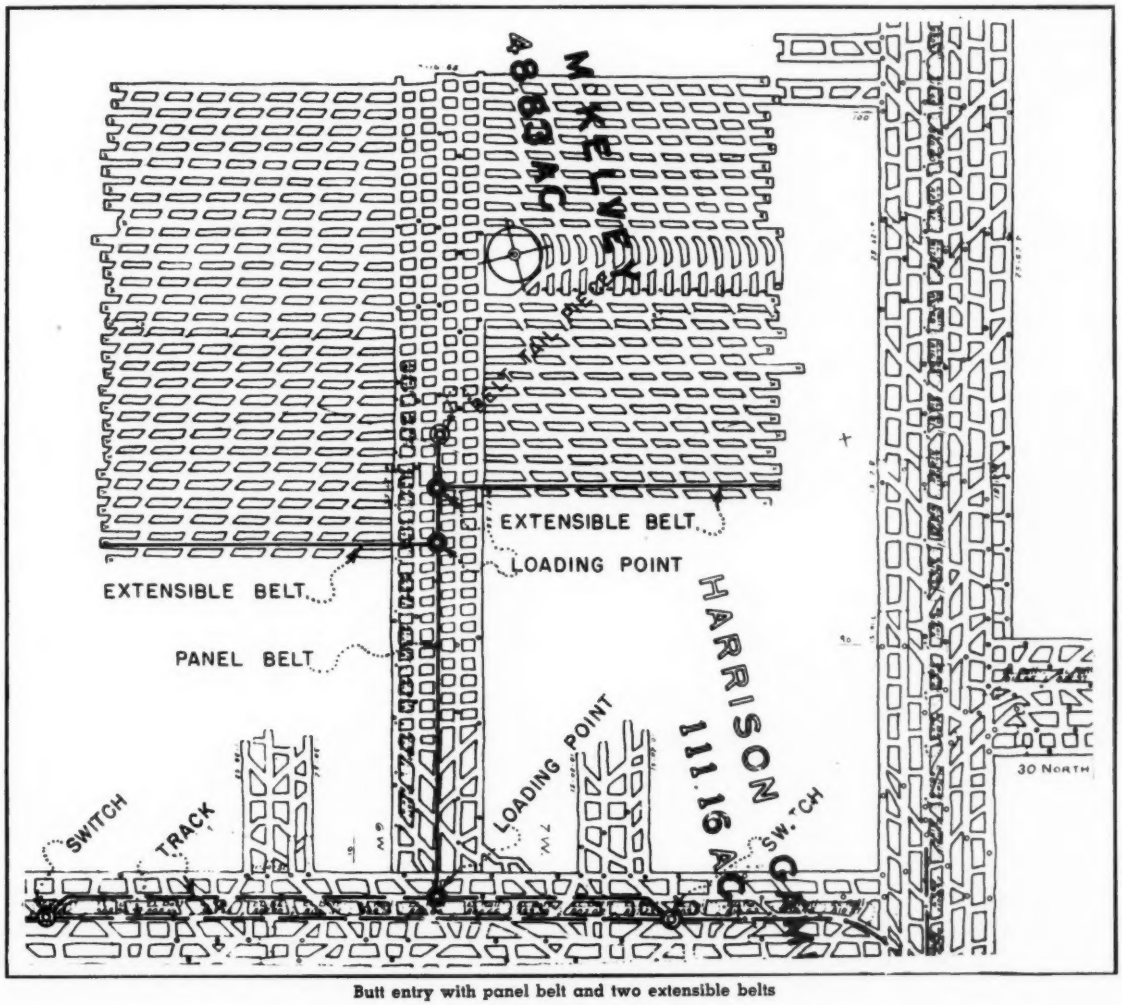
In the fall of 1953, two 3-JCM continuous miners were installed. Seam conditions at this mine do not lend themselves to good continuous mining. The coal is hard and dusty with three separate bands of sulphur which break out easily unless they are in the sumping range. The seam is approximately 63 in. high and is overlain with drawslate that varies in thickness from 1 to 48 in. with numerous hidden slips and rolls. It is not an unusual condition to find one in. of drawslate on one rib and 48 in. on the opposite side. Immediately over the stone, the roof coal varies from 1 to 30 in. in thickness. Because of the hidden slips and varying thickness of the drawslate and roof coal, it became necessary to apply an approved minimum timbering plan. Presently we are using 4-in. "H" beams, 12 ft long, on 3-ft centers in room work.

Trial and Error Methods

The room and pillar method of mining is presently used with two continuous miners working in rooms on one set of butt entries. The butt entries are developed by conventional mining equipment and all entries and crosscuts are roof bolted. The projection calls for entries to be driven in sets of five on 40-ft centers for a distance of 1700 ft, and crosscuts are turned opposite room necks to accommodate the extensible belt unit setup on 32-ft centers.

Trial and error methods predominated in the first continuous mining operations at No. 3 mine. By the use of shuttle cars and surge cars, much experience was gained with this type of haulage. An excessive amount of spillage however was had with this method and the transportation car was never fully loaded. Later a conventional loading machine was used behind the continuous miner with the floor as a surge bin. The coal that piled up not only obstructed ventilation but complicated the delivery of supplies to the face. This method also required constant shoveling of coal from behind the two rows of posts along each rib.

In an effort to get a perfected continuous flow of coal from the continuous mining equipment, a panel belt and two extensible belts were purchased. In August 1955 this installation was made and the transition from buggies to extensible belts began. This new system eliminated six surge car and six shuttle car operators since these two units work on a three-shift basis. It has also been found that many mechanical and electrical delays that were previously encountered in transporting coal with shuttle cars, as well as many shuttle car hazards when hauling under steel timbers, have been completely eliminated. As an example of this last effect, the use of extensible belts has completely eliminated the dangers from posts being knocked out by shuttle cars.



Butt entry with panel belt and two extensible belts

With shuttle car mining, the air was constantly being disrupted by the cars going through swinging doors to the discharge point; however with the extensible belt, this no longer presents a problem.

Extensible Belt Overcomes Haulage Difficulty

Operation of a continuous miner and an extensible belt entails driving only one place at a time and it has been found possible to provide closer supervision at the working face. Because of rapid advancement, closer supervision is a necessity since careful attention must be given to roof control, supply and recovery work and providing adequate ventilation at the working face.

The working place must be kept properly rock-dusted and sufficient water pressure must be maintained to effectively allay the dust at the face.

vides an intermediate haulage system as near to continuous haulage as is possible with present day mechanical equipment. Granting that there are "bugs" to be eliminated, they will be reduced as more extensible belts are put into use and mine service representatives have an opportunity to add their improvements and make refinements.

Description of Operation

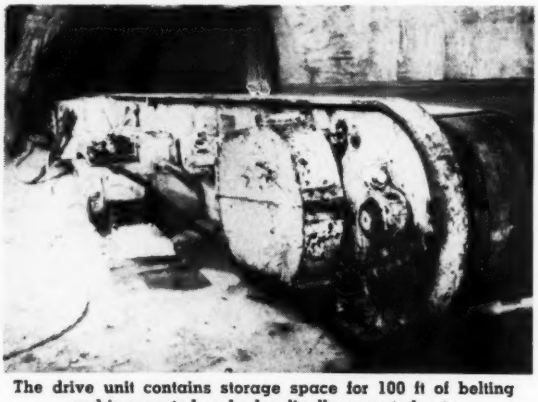
The extensible belt consists of the drive unit, which contains storage space for 100 ft of belting, and the hydraulic and electrical components necessary for control and operation. This unit is approximately 28 ft long and is mounted on hydraulically operated cats which facilitate moving and positioning. The rubber belting is stored within this unit by means of a hydraulically operated cluster of pulleys which maintain a predetermined tension in the belt and allows for removal of the belting from the cluster as the tailpiece is moved away from the head section.

The tail unit is self-propelled and contains a self-aligning pulley which allows for improper tailpiece alignment. It also contains the hydraulic traction units, emergency stop controls, and a signal light that shows when the cluster mechanism in the head section is out of belting. The 16-ft bridge conveyor which serves to tie the continuous miner to the tailpiece has approximately 11 ft of travel by means of sliderails on the tailpiece before the tail section has to be moved up.

Fabrication or framework necessary to support the belt and to provide a troughed carrying run, consists of upright stands onto which are slung "limber rollers." These are made with Neoprene rubber discs molded onto a wire rope which is attached to prelubricated bearings on the ends. The upright stands are spaced on eight-ft centers and are held together longitudinally with angle iron railings on each side. Return rollers are mounted on low fixed stands and are equipped with pre-lubricated bearings. Deflecting the return roller to one side or the other readily trains the return side of the belt while the "limber rollers" tend to be self-aligning on the carrying run. The return roller stands are placed at whatever intervals are necessary to keep the belt off the bottom.

Adding a 100-ft roll of belt consumes three to five minutes and is accomplished by two men. Moving out of one room and into another, as stated previously, requires approximately 60 minutes. The two section mechanics take off belt while the two face timbermen and a recovery-man take out fabrication and move the tail piece. The miner operator trams the machine out of the place and helps with dismantling fabrication.

The belt take-off is made in sequence—that is, one section of top belt, and then one section of bottom belt. This method leaves a clean path for the timbermen removing stands, which they store to the sides as this room will be a supply source for the next advancing room.



The drive unit contains storage space for 100 ft of belting and is mounted on hydraulically operated cats

A 16-ft bridge conveyor serves to tie the continuous miner to the extensible conveyor

We have every reason to believe and our records show that accidents on continuous miner—extensible belt units are less frequent than in conventional units, due primarily to concentration of working equipment and closer supervision.

Continuous mining—the steady flow of coal from the face—has been a dream of mining men for many years. With the development of the extensible belt in the past few years, this dream is now a near reality. For this reason Powhatan is actively and energetically engaged in a program of perfecting the best mining system for utilizing the continuous miner—extensible belt combination. Both units in a panel discharge onto a 30-in. panel belt, which in turn, loads the coal into six-ton mine cars on the face entry. One miner works on each side of the panel belt in rooms which are driven 640 ft deep on 32-ft centers with crosscuts at 50-ft intervals. Moving to a new room is done between shifts. As the crews gained experience, moving time has dropped from 90 to an average of 60 minutes per move and set-up.

The extensible belt in operation pro-

Drive Rooms on 90° Angle

The mining system used is a retreat system and only first mining is attempted. When the miner works out a room, the timbers are left intact since the room adjacent to the advancing place is used as a supply route. The timbers are recovered from the room next to the supply route and used to supply the advancing room. This cycle is followed until the section is completely finished. One hundred percent recovery of steel timbers is an economic necessity while about 50 percent of the wooden posts are recovered and 65 percent of the wedge cap pieces.

Each miner unit consists of one miner operator, two timbermen, and one mechanic. One pit car loading head operator serves both units and also one foreman is in charge of the two units. Supply track is laid on either side of the panel belt, thus providing each miner with a separate supply source. One 500,000 CM feeder

and one 500,000 CM return cable is carried up each supply track, allowing for an adequate supply of power for each unit.

Several methods of driving rooms have been explored and much experience was gained in room work. Initially rooms were driven on a 60° angle to a depth of 260 ft on 25-ft centers. Seven rooms were worked out on each side of the belt and a safety block was left for protection. Despite the fact that reservations were left, we continued to be plagued by squeeze conditions. This was a constant worry to the management when it was realized that working on this angle the men and equipment were placed in a critical area. Sometimes it was found necessary to leave a block of coal five rooms wide to check a squeeze. At this point it was decided to drive all rooms on a 90° angle so the equipment would, at all times, be adjacent to solid coal and this, in turn, would better facilitate equipment moves in case of a squeeze.

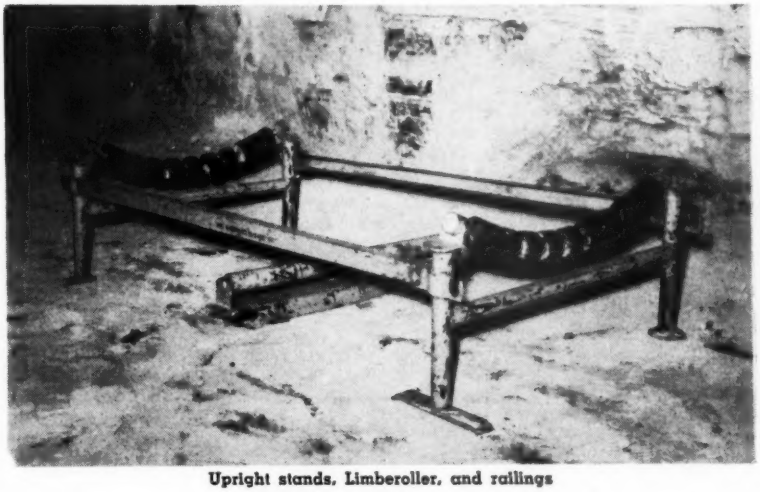
At the present time we are driving rooms at a 90° angle with two extensible belts. These rooms are driven in 640 ft on 32-ft centers without leaving any reservations. Under this plan our purpose is to leave an equal amount of coal in each pillar for protection. This system has eliminated all squeezes and additionally our percentage of extraction is somewhat greater.

May Accelerate Adoption of Continuous Mining

An extensible belt can be valuable in working out a large block of coal. For example, in one of our panel projections it would require seven sets of butt entries to work out the area, meaning that seven sets of butt entries would have to be tracked, wired, and ventilated. Under the extensible belt system this large block of coal will be worked out with three sets of butt entries. Consequently deep rooms have reduced the development cost substantially.

To date maintenance has been one of our greatest problems and the loss of tonnage due to breakdowns has been frequent, but a well-planned maintenance program can minimize the breakdowns. While maintenance cost is high for one combination machine, we do not believe that the cost exceeds that of equipment used in a conventional unit.

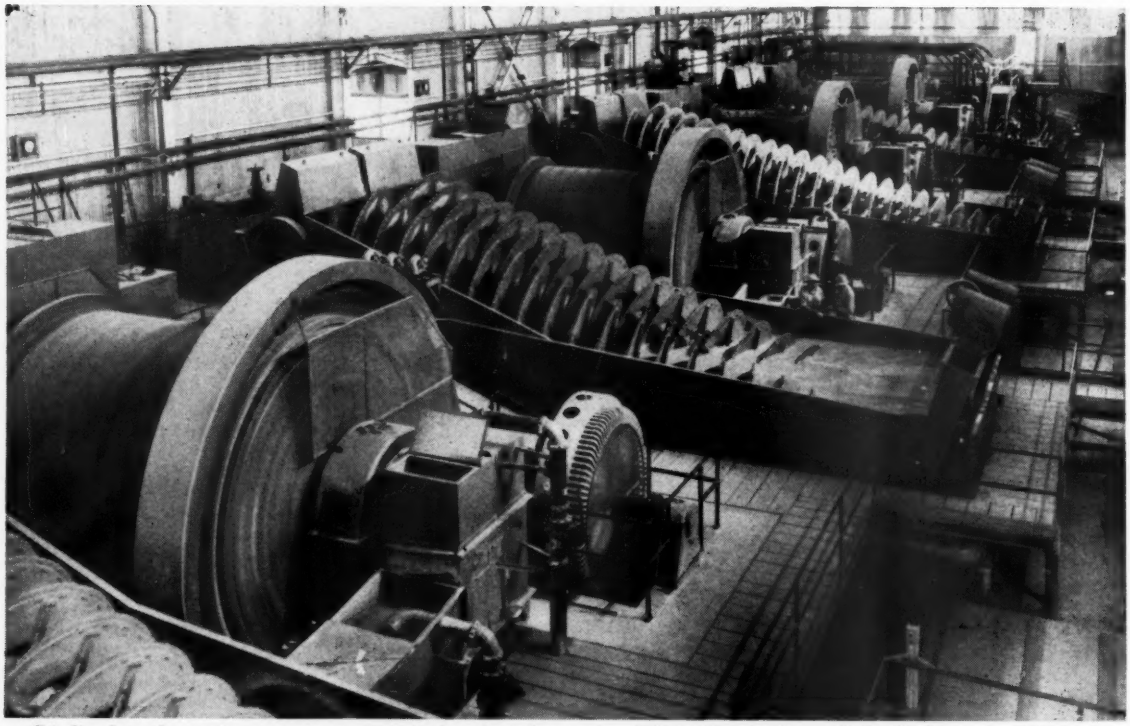
We do sincerely believe that continuous miners and extensible belts will, in due time, take their rightful place in the mining industry. Since 1951 the tonnage mined by this revolutionary method has increased from 8,000,000 to 25,000,000 tons this past year. This tremendous increase in such a short period of time clearly indicates that, despite the many handicaps under which these machines operate, the reduction in labor and operating costs cannot be ignored by the industry. All over the world, during the past few years, the pace in all industry has increased rapidly and the advent of the continuous miner and extensible belt has provided the coal industry with the means of keeping up. In fact, almost every conceivable device that man's ingenuity has been able to develop to speed production and lower cost is at our hands.



Upright stands, Limberoller, and railings

Two men take from three to five minutes to add a 100-ft roll of belt

Wet Versus Dry Grinding



Grinding bay of a western copper ore concentrating plant showing four 10½ by 12 ft diaphragm ball mills driven direct by four 900-hp, 400-v, 257 rpm synchronous motors

An evaluation of the factors which differentiate wet and dry reduction—outlining the principal advantages of each method

By FRED C. BOND
Consulting Engineer
Processing Machinery Department
Allis-Chalmers Mfg. Co.

GRINDING constitutes one of the major items of cost in the winning of metals. As a very rough average it is estimated that five to ten percent of the total production cost of such metals as copper, lead, zinc, gold and silver, represents the cost of crushing and grinding alone. Moreover, this proportion increases as the ores become leaner, and as it becomes profitable to treat new deposits of lower grade. Even in the steel industry grinding costs are mounting as the low grade taconite ores come into production.

Grinding is also important in many fields outside of metal production. These include portland cement, coal, agricultural limestone, phosphates and industrial minerals in general.

Some understanding of grinding theory is necessary to evaluate the factors which differentiate wet and dry reduction.

How Rock Is Broken

Rock is usually broken by compressive squeezing. When a particle of rock is subjected to rapid or slow compression, its shape is deformed and it absorbs strain energy. When the rock is locally strained beyond its breaking strength, a crack tip forms, the surrounding strain energy flows to the crack tip, rapidly enlarging it, the strain energy flow causes other crack tips to form, and the rock breaks with release of the absorbed strain energy as heat. The first crack tip usually is formed by the rock pulling apart under tension or shear just outside of the area under compressive contact. According to the Third Theory, the useful work done is proportional to the length of the crack tips formed, which is proportional to the square root of the new surface area produced, and inversely proportional to the square root of the diameter of the product particles.

When P represents the diameter in microns of the square hole which 80 percent of the product passes, F is the size 80 percent of the feed passes, W is the kwh required per short ton and Wi is the work index, or the kwh per ton required to reduce from theoretically infinite feed size to 80 percent passing 100 microns, then

$$W = \frac{10\ Wi}{\sqrt{P}} \quad \frac{10\ Wi}{\sqrt{F}}$$

This is the basic equation of the Third Theory; any one of the four quantitives concerned can be found from it when the other three are

known. It is used to find the work and power input required in crushing and grinding

According to the old Rittinger Theory, the useful work done is directly proportional to the surface area produced. According to the Kick Theory, the work is proportional to the logarithm of the reduction ratio, or log F/P. The Third Theory corresponds much more exactly with actual plant crushing and grinding results, and can be used to compare the relative efficiencies of wet and dry grinding.

When water is added in increasing amounts to a dry grinding mill, the mill discharge first decreases, then stops entirely, and finally again discharges as a wet pulp. Dry grinding and wet grinding are separated by a range of moisture content which forms a thick mud unable to flow through the mill. This mudding moisture content increases with the specific surface area of the solid and ranges from perhaps 4 percent to 15 percent in ordinary grinding.

Wet Grinding

Nearly all the ores of metals are ground wet. Flotation and other concentration processes following grinding usually require a wet product, and dry grinding might encourage surface oxidation and inhibit flotation. Moreover, the increased plant cleanliness, ease of transport, and several other factors favor wet grinding.

Wet grinding ball, rod or pebble mills are either of the high level overflow discharge type; or have a low level or intermediate level discharge through diaphragm grates, or through peripheral discharge ports in the case of rod mills. The percent moisture is usually measured in the mill discharge. However, in all cases the percent moisture in the pulp within the mill is less than that of the pulp entering and leaving the mill, since the water and fine particles flow through the mill more rapidly than the larger particles. The amount of this difference is difficult to determine, but it is greater in the low level discharge mills than in the overflow mills.

The auxiliary power required for closed circuit wet grinding with spiral or reciprocating rake classifiers is very small, only a few percent of the power to the mill. With wet cyclones it is slightly higher.

The most efficient grind is obtained at the lowest work index. As the percent moisture is increased beyond that necessary for pulp to flow from the mill, the work index decreases with the pulp viscosity and commonly levels off at a certain moisture content, depending upon the fineness of grind and other factors. In a typical case, a material with a dry grinding work index of 16 may increase to 25 at three percent moisture, approach infinity at 12 percent, reach 16 again at 20 percent and level off at 12 at 35 percent moisture and above.

Methods are now available for measuring the viscosity of rapidly settling pulp, and the relationship between viscosity and grinding efficiency should be thoroughly explored. Very little experimental work has been done on the subject. There are indications that an increase of 10° F in wet pulp temperature increases the grinding efficiency about one percent.

Dry Grinding

Because of the higher effective viscosity of the charge, dry grinding mills usually require low level diaphragm discharges or peripheral discharges in the case of rod mills. An exception is the extremely fine grinding of materials which do not tend to coat the balls and mill linings, such as glass and silica flour. These materials flow more readily when ground fine.

Many dry grinding installations are limited in performance by ball coating. The fine particles build up adhering coatings on the grinding balls and mill linings which cushion the impact blows and limit the fineness which can be produced. Moisture usually increases the coating, but it often forms from bone dry materials. Different materials show widely different coating effects. The best remedy is removal of fines by closed circuiting, and wiping off the coating by circulating coarse particles in the mill.

Closed circuiting in dry grinding requires more equipment and power than in wet grinding, and the circulating loads are higher and classifier efficiencies are lower. Abrasive wear of metal parts may be higher, resulting in higher maintenance costs. The building space required is greater. There is usually some dust present, and the working conditions may be less pleasant.

Extensive comparisons of the power required for wet and dry grinding have been made. Efficient dry grinding without complications resulting from ball coating requires approximately 4/3 as many kwh per ton input to the mill alone as does wet grinding with the same feed and product sizes. The auxiliary power requirements are also greater. When ball coating is present, the 4/3 ratio will increase greatly.

Many dry grinding mills are connected with an exhaust fan to remove fine dust from the mill. Some are air swept, with an air stream through the mill of sufficient velocity to carry out all of the particles discharged by the mill. In such a mill the power to the exhaust fan may range from 50 to 90 percent of the power input to the mill

TABLE I

The principal advantages of wet and dry grinding

WET	DRY
Advantages	Advantages
(1) Power input to mill ¾ of dry grinding	(1) Metal wear 1/5 that of wet grinding
(2) Less auxiliary power	(2) Less iron contamination of product
(3) Less auxiliary equipment	(3) Less mill maintenance and replacement of wearing parts
(4) Less dust, better working conditions	(4) Less building heating and no danger of winter freezing
(5) Easier transport of materials	(5) No water supply necessary
(6) Cheaper and more efficient closed circuit operation	
(7) Better mixing and blending, more uniform product	
(8) Less heating in mill	
(9) Not necessary to dry moist feed	
(10) No ball coating trouble	

About the Author

FRED C. BOND attended the University of Denver and the Colorado School of Mines, receiving degrees of Engineer of Mines and Master of Science.

He was employed as an assayer and millman by the New York and Honduras Rosario Mining Co. and as a designer by the Tennessee Copper Corp. From 1930 to 1947 he was director of the basic industries research laboratory, Allis-Chalmers Mfg. Co. He was in charge of constructing the radium-uranium concentrator plant of Eldorado Gold Mines, Ltd., Northwest Territory. Another project that he worked on was the gold flotation plant of the Compania Minera Nacional at Huachon, Peru. Bond's present position is consulting engineer for the processing machinery department, Allis-Chalmers Mfg. Co.

Author of about 50 technical papers chiefly on grinding, crushing and mineral dressing, he originated the Third Theory of Comminution.

TABLE II

A hypothetical comparison of the costs of wet and dry grinding an average silicious ore is given. Since the figures are merely estimates, the principal value of the table is to show that the costs of wet and dry grinding are roughly comparable.

	WET	DRY
Work index	12	16
Kwh per ton—to mill	9	12
Kwh per ton—to auxiliary	1	4
Power cost		
Cents/ton at 1.5 cents/kwh	15	24
Metal wear		
Pounds balls per ton ground	1.43	0.34
Kwh per pound balls	7	35
Cents/ton at 8 cents/lb	11.4	2.7
Pounds liners per ton ground	0.30	0.07
Kwh per pound liner	30	175
Cents/ton at 14 cents/lb	4.2	1.0
Operating costs—cents/ton		
Maintenance—Labor	2	1
Operation—Labor	4	4
Operation—Supervision	2	2
Total cost—cents/ton	38.6	34.7

alone, depending principally upon the particle sizes to be drawn from the mill.

When large pieces of ore form the grinding media in dry grinding air swept mills discharging at about eight mesh, the power to the exhaust fans nearly equals that required to rotate the mill. Air sweeping is an expensive method of removing product from a mill, particularly when the product is coarse.

The principal item of grinding expense in which dry grinding mills excel wet mills is metal wear. The ball and liner wear in dry grinding mills is only a fraction of that in wet grinding. Dry grinding metal wear ranges from about 20 percent of that of wet grinding silicious ores, to around 10 percent for soft limestones. It is at a minimum when ball coating is present and when the mill discharge level is high.

Much of the metal consumption in wet grinding results from the dissolution of the newly formed metal surfaces by water, with the formation of hydrogen gas. Part of the dissolved iron oxide is deposited as a surface film or stain on the material being ground. Dry grinding products show less iron oxide contamination than wet products, and dry grinding is sometimes required for this reason.

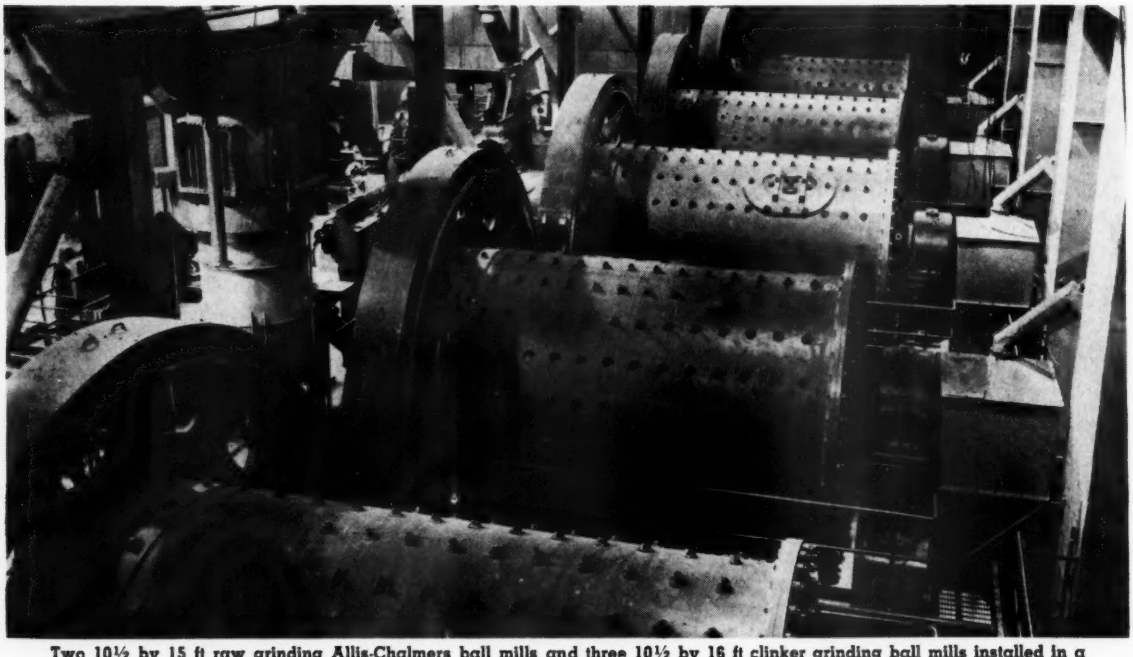
Wet and dry mill speeds are about the same. The grinding efficiency of wet mills begins to decrease when the mill speed exceeds about 77 percent of the critical speed. However, there are indications that dry mills could be operated efficiently at somewhat higher speeds.

Circumstances Determine Method

In most applications the use of wet or dry grinding mills is dictated by extraneous circumstances. If a dry mill product is necessary, dry grinding is indicated. If the grind is followed by wet concentration by flotation or gravity methods, wet grinding will probably be chosen. This is particularly true in flotation plants where dry grinding is found to oxidize the sulphide mineral surfaces and impair the flotation results. In some locations scarcity of water may require dry processing. In others, high moisture content of the feed may make wet treatment more economical than drying and grinding. There are few cases where the choice is determined only by the relative costs per ton of wet and dry grinding.

The over-all costs are not very different in wet and dry flow discharge mills. In dry air swept mills the costs are higher. Rock media grinding reduces metal costs. Dry grinding is found in regions of low power cost, high transportation or other metal costs, and low water supply. Wet grinding is favored by high power costs, good transportation facilities, and settled locations where dust is more objectionable.

However, individual circumstances will determine the choice of methods in each instance, and no general rule can be applied.



Two 10½ by 15 ft raw grinding Allis-Chalmers ball mills and three 10½ by 16 ft clinker grinding ball mills installed in a cement plant

Koepe Hoist Installations At Cliffs Shaft Mine

Confined underground and surface conditions presented problems that could be solved best by mounting hoisting equipment directly over the shaft opening. Thus Cleveland-Cliffs engineers conceived the first Koepe hoist installation in North America. Installation and operating features of this ingenuous Swedish equipment are described in detail

By E. D. CORY
Chief Electrical Engineer
The Cleveland-Cliffs Iron Co.

THE first installation of multiple rope Koepe hoists on the North American Continent is now in successful operation at the C shaft of the Cliffs Shaft Mine of The Cleveland-Cliffs Iron Co., Ishpeming, Mich. The intent of this paper is to describe this particular installation and omit material which has been previously published and is descriptive of Koepe hoists in general.

The Cliffs Shaft Mine has produced approximately 23,000,000 tons of hard lump iron ore since commencement of production in 1883. The bulk of this production was hoisted through two operating shafts known as A and B, which were equipped with conventional drum hoists and counterweighted skip-cage combinations capable of handling 20 men or 5½ tons of ore at 1000 fpm from a depth of 1200 ft.

In early 1952, after an intensive economic study of the property had been completed, plans were put into effect to sink a new central shaft to be called C shaft and located approximately mid-distant between shafts A and B, and equip it with the most modern man, materials and ore hoisting equipment available. Plans called for a skip hoisting facility capable of handling 430 long tons per hour from a depth of 1272 ft, which meant that hoisting could be confined to day shift only. The man hoist was to be capable of handling 75 men or 15,000 lb per trip. The hoists were also to be capable of performing the duty cycles indicated under the "Future" headings in the data table. Whereas the old ore handling system required surface crushing and sizing of the product, the new plant would be arranged for underground crushing in two stages and the only treatment to be accomplished on surface would be the division of the product into a small (minus 2-in.) and a lump (minus 6-in. plus 2-in.) fraction.

Shaft Site Poses Problem

As past hoisting practice in this mining area had been with conventional drum hoist equipment, it was only natural that hoisting machinery plans for the new C shaft would follow along the same lines. An impasse was met, however, when it came to the location of the engine house to serve the shaft. The shaft site was fixed by location of old underground workings. In order to provide uniform tramming distances and the shaft to be located in solid ground, a site had to be chosen so that the shaft opening would traverse a minimum of open stopes.

Reference to figure 1 will illustrate the following surface problems. On the south side of the shaft site are the stockpile area and service tracks. To

KOEPE HOIST DATA
(As of October 1, 1956)

	Skip Hoists (2)		Cage Hoist	
	Present	Future	Present	Future
Hoisting Distance	1272′	4000′	1316′	4000′
Net Load	30,000#	30,000#	15,000#	15,000#
Weight Skip or Cage	19,362#	20,000#	16,663#	13,000#
Weight Counterweight	34,362#	35,000#	24,163#	20,500#
No. and Size Hoist Ropes	4-1″ diam	4-1⅛″ diam	4-1″ diam	4-1″ diam
No. and Size Tail Ropes	2-1⅜″ diam	4-1⅛″ diam	4-1″ diam	4-1″ diam
Factor of Safety	6.8	5.7	9.6	7.1
Hoisting Speed	1500 fpm	2000 fpm	1100 fpm	2000 fpm
Drum Diameter	118″	118″	89″	89″
Tread Pressure	252 psi*	329 psi*	236 psi*	344 psi*
WR² of Rotating Parts	2,000,000 lb ft²	2,000,000 lb ft²	500,000 lb ft²	500,000 lb ft²
Trips per Hour	32	22		
RMS HP		1200		655
Acceleration Time	10 sec	15 sec	15 sec	15 sec
Retardation Time	10 sec	15 sec	15 sec	15 sec

*These values are reduced 37.5% if flattened strand ropes are used.

About the Author

E. DANA CORY graduated in 1929 from the Georgia School of Technology with the degree of B. S. in Engineering. His first employment after graduation was with the Westinghouse Electric Corp. in East Pittsburgh, Pa., as engineering trainee and later as an electrical engineer in the switchboard engineering department. He was employed as an electrical engineer by the following consulting engineering firms: Sanderson and Porter, Peter F. Loftus Corp., and Sargent and Lundy. Since 1943, Cory has held the position of chief electrical engineer in The Cleveland-Cliffs Iron Company's ore mining department, Michigan Mines.

the west is the existing engine house serving the old A and B shafts. On the east side are a central chemical laboratory and sample handling facility. To the north are a lake and the mine office buildings. Many conventional drum hoist layouts were made, but all had to be discarded due to interference with existing installations or for reasons of poor arrangement conditions. This led the planning staff to the conclusion that surface plant space problems could be solved if the conventional drum hoist could be eliminated and the hoisting machinery mounted directly over the shaft opening.

We had heard about the expanding continental practice of mounting Koepe hoists in the headframe directly over the shaft, but had previously not given them any consideration because of skepticism regarding the application of the Koepe hoist principle to hoisting under wet and occasionally muddy shaft conditions. However, the Cliffs Shaft conditions are different than those usually encountered in the Marquette Range area. This is a hard ore property, whereas all of the other underground mines operated by the company are mining soft hematite. It was felt that surface water could be adequately sealed off and to all intents and purposes the new shaft could be maintained relatively dry. Also, it was felt that skip loading arrangements could be designed for the free-running, crushed lump ore so that spillage at the loading station could be practically eliminated.

As a result, the planning changed to a consideration of the tower type, multiple rope Koepe hoist. Preliminary investigation substantiated earlier thinking that the C shaft conditions were a "natural" for the tower type Koepe hoist. In June 1952 company personnel inspected various Koepe hoist installations in Sweden and reported to management that such a hoisting system would apply to the new C shaft conditions, and by the end of the year formal orders were placed with Asea, a Swedish manufacturer, for two independent skip hoists and one man hoist. The hoists, including electric controls, were to be of Swedish manufacture. The driving motors, motor-generator sets, auxiliary compressed air equipment, ropes, cage, skips, counterweights, etc. were to be manufactured in the United States. These units were received in the fall of 1954, erected during the summer of 1955, and placed in regular operation in December 1955. To date, approximately 500,000 long tons of ore have been hoisted with the two skip hoists from a single hoisting level. The push button operated, multi-level cage hoist has been in operation seven months and has also performed satisfactorily.

175-Ft High Headframe

Inspection of Koepe hoist installations in Sweden called attention to the desirability of concrete construction in building the headframe for tower type installations for reasons of rigidity and permanency. Cost estimates indicated that the most economical structure that would suit our needs and still give us the above mentioned requisites would be a combination of reinforced concrete and structural steel. Accordingly, a tower type headframe was designed to include a 28 by 28ft outside dimension concrete base structure rising 119 ft 2 in. above collar and extending 52 ft below collar, where it was locked into ledge. A total of 1665 cu yd of concrete was poured with 58 percent of this being placed below collar elevation. A structural steel portion on the north side provides a stairway and service elevator shaft.

The engine house portion of the headframe consists of a triple deck structural steel superstructure, 28 by 56 ft in plan and 54 ft 10 in. high to top of steel, mounted above the vertical concrete structure. The overall exposed height is 175 ft, including roof and cornice. The structural steel portions are enclosed. The engine house portion is insulated with two-in. fibre glass. The stairwell and service elevator portions on the north side are uninsulated.

Description of Hoisting Plant

Each of the three hoists serving C shaft is an independent unit handling a cage or skip in balance with a counterweight. At the moment we are utilizing single level ore hoisting, which could be advantageously handled by skips in balance. Future plans include the possibility of extending the shaft to an ultimate 4000 ft or more

Figure 1. Many conventional drum hoist layouts were made, but all had to be discarded due to interference with existing installations. The tower type Koepe hoist with hoisting equipment mounted directly over the shaft proved a "natural" for the C shaft conditions

and employing multiple level loading. Therefore, two independent skip hoists with counterbalance arrangement are used for maximum flexibility.

Figure 4 shows the horizontal cross-section of the shaft. The double deck, 75-man capacity cage operates in the left hand compartment which is equipped with four 6 by 10 fir guides. Its counterweight compartment is immediately adjacent centrally and is equipped with two 5 by 7½ fir guides. On each side of this compartment are the skip counterweight compartments equipped with identical guides. To the right are the compressed air, water column, electric cable and manway compartments. On the extreme right hand side are the two skip compartments, each equipped with two 6 by 10 fir guides. The steel shaft sets are vertically spaced on seven-ft centers.

Figure 5 shows vertical sections through the headframe and shaft. For reasons of clarity, details are omitted. The cage hoist is shown at top left on the top deck of the headframe superstructure. Its deflection sheaves are mounted immediately below it and are used to deflect the counterweight sides of the hoist ropes to the center of the counterweight compartment. Below this intermediate deck and mounted directly upon the top of the reinforced concrete structure is the skip hoist deck. Immediately below the skip hoist deck and within the concrete structure are the skip rope deflection sheaves. Here again the counterweight sides of the hoist ropes are deflected to the centers of their respective counterweight compartments.

Swedish practice is to design the shaft to suit the required hoist. In other words, the center to center dimension of skip and counterweight compartments would be the same as the center to center of rope diameter of the drive pulley . In our case we were desirous of holding the shaft size to a minimum for economic reasons and used deflection sheaves, possibly sacrificing some rope life as a consequence.

The safety wedges conform to Swedish design as to shape and location at the ends of the fir guides. In effect, they are flared guide ends on which the sides of the cage, skip or counterweight guide shoes gradually jam as the wedges enter the guide shoes in the event of extreme overtravel of the cage, skip or counterweight.

Wooden tail rope rub bars are not shown but are 3 by 10 fir timbers which are placed at right angles to the tail rope bottom loop, at about the elevation of the center of the loop and with one bar on each side of the counterweight compartment. Their function is to prevent the tail ropes from striking the steel framing of the compartment during the acceleration and retardation periods when the rope loop swings in the plane of the loop. They are installed on both cage and skip hoists.

Wooden, tail rope guide bars are not shown but are 3 by 10 fir timbers which are placed horizontally, between and outside the loops of the tail ropes and at about the elevation of the rub bars. Their function is to separate and hold in line the tail rope loops so that they do not strike each other or adjacent structures. They are installed on the cage hoist only.

We have observed very little wear on these bars but know that they perform a useful function.

Cage Hoist Above Skip Hoists

Figure 2 shows the cage hoist which is located on the top deck of the superstructure. The 89-in. diam drive pulley is equipped with four one-in. diam, 6 by 27 Type H, lang lay, flattened strand, fibre center, prestressed, galvanized hoist ropes having a breaking strength of 50.8 tons each and weighing 1.808 lb per ft. The ropes are installed with alternate lay to equalize rotative effect. The static factor of safety for present operating conditions is 9.6. In the upper right hand corner can be seen an overhead travelling crane which is designed for a lift of 170 ft. This crane hoisted all the hoist components from the ground through removable hatches in the cantilevered portion of the skip hoist deck.

The two independent skip hoists are shown in Figure 3. Each has a 118-in. diam drive pulley equipped with four one-in. diam hoist ropes with specification identical to the cage hoist ropes above described. Static factor of safety for present operating conditions is 6.8. The skip hoists are equipped with a single brake, whereas the cage hoist has dual brakes. This was a compromise arrangement because the two skip hoists had to be crowded together to position the ropes in their respective compartments. Also note that the axes of the two skip hoists are not in line. It was necessary to angle them 17½° to allow the hoist ropes from the cage hoist above to pass between the two skip hoists and properly position the counterweight compartments. The cage hoist was not placed below the skip hoists because it would have interfered with the skip hoist ropes.

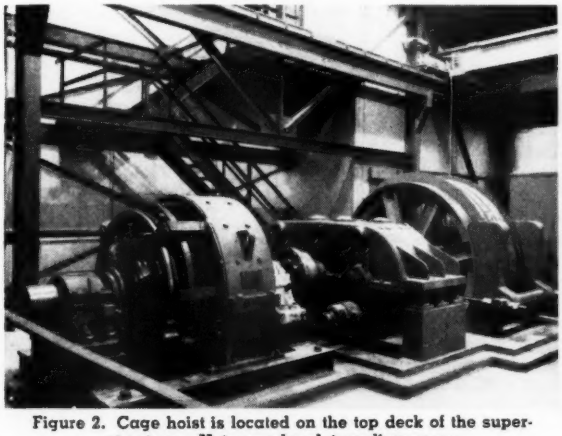


Figure 2. Cage hoist is located on the top deck of the superstructure. Note overhead traveling crane

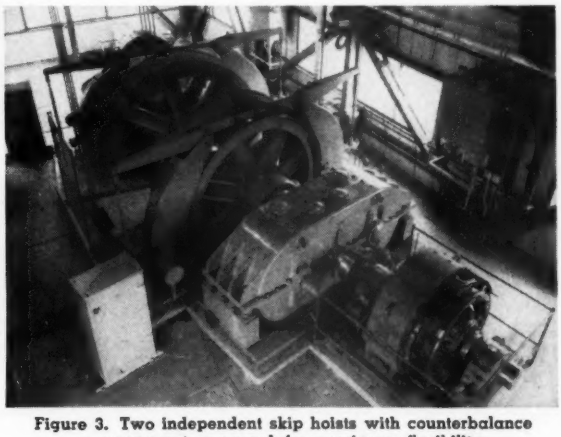


Figure 3. Two independent skip hoists with counterbalance arrangement are used for maximum flexibility

Tail Ropes

The cage hoist is equipped with four one-in. diam, bright 18 by 19 Seale, non-rotating, traction grade fibre center tail ropes weighing 1.780 lb per ft and laid up with heavy duty internal and external lubrication. Four one-in. diam ropes were chosen for this service because it was desirable to hold the return loop diameter to a maximum of 54 in. which is the center of cage to center of cage counterweight compartment dimension. The natural loop diameter formed is actually 52½ in.

Each of the skip hoists is equipped with two 1⅜-in. diam, bright 19 by 19 construction tail ropes of similar construction, weighing 3.572 lb per

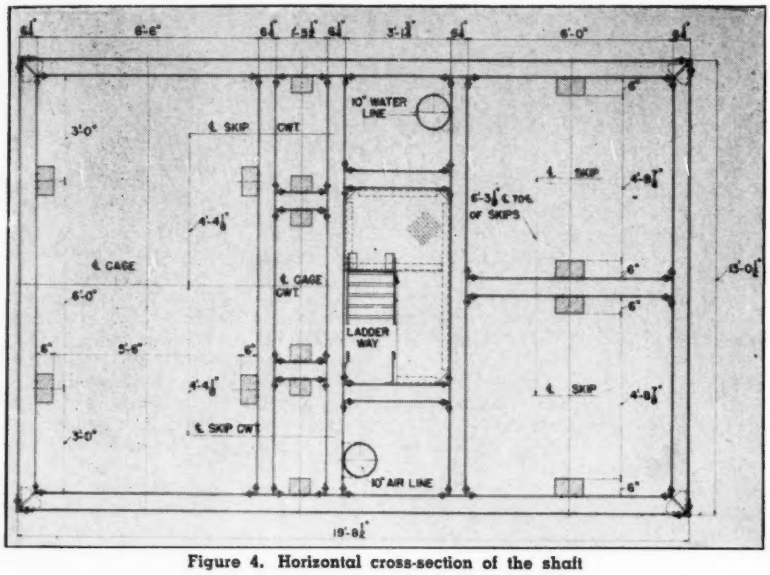


Figure 4. Horizontal cross-section of the shaft

ft. In this case the return loop diameter was not critical and so the 1⅜-in. size was chosen to give the proper weight per foot and still give a rope that could be easily handled.

All of the above mentioned tail ropes were installed with Miller ball bearing swivels at each end to insure smooth operation at the loop end. After seven months of operation the swivels were removed from the counterweight end of one set of skip tail ropes to determine if tail rope operation would remain smooth without same. It was necessary to reinstall these swivels because there developed a tendency for the two tail ropes to wander and cross one another at the return loop position.

The counterweight boxes used on the three Koepe hoists were designed by our engineering department and consist of fabricated steel units of articulated design so as to follow the guides in case shaft alignment should shift. The boxes are filled with 2 by 2 by 54-in. H. R. carbon steel bars to give the necessary counterweighting effect. Five such boxes are used with each skip hoist and three for the cage hoist.

The skip hoists are equipped with 240 cu ft bottom dump "Jeto" skips capable of holding 30,000 lb of iron ore with 3½ ft of freeboard. The skip suspension device incorporates an equalization mechanism and means of rapid rope tension adjustment. This unit was designed on the pattern of those used in Sweden and was manufactured in our shops.

Movement of Ore

The movement of ore for the present condition after it is mined on the various upper levels and trammed to the vicinity of the C shaft is as follows. On the various levels it is dumped into suitably controlled downward passes which conduct it to the crusher room located below the lowest mining level. Here it is screened, picked, suitably crushed to the required sizes and fed through a downward pass which conducts it to the skip loading pockets. Each of the two skip loading pockets has an air operated gate above it which is manually controlled to fill the pocket to the desired level.

An air operated, manually controlled gate on each loading pocket releases ore into its respective skip and the ore is then conveyed to the surface and dumped into a receiving bin from which it is moved to a conveyor belt by a vibratory feeder. The belt conveys the ore through a gallery to a double deck screen which separates the ore into small and lump sizes which are respectively deposited in two bins. From these bins, the ore is discharged through gates into 34-ton trucks for placement on the storage piles or into railway ore cars for immediate shipment from the mine, as determined by shipping requirements.

Rock from the upper mining levels is stored in old stopes. Rock from the lowest level only is dumped into a downward pass which conducts it directly to one of the skip loading pockets, but it is held in the pass by a gate until it is desired that it be hoisted to surface. Rock which is picked from the ore in the crusher room is also fed into this rock pass. Rock which is hoisted to surface is dumped through a by-pass into trucks which haul it to a waste pile.

Motors and Controls

All three hoists are powered by dc motors with Ward Leonard controls arranged for remote push button as well as manual operation. The hoist control panels and motor generator sets are located on ground level in a wing of the existing engine house.

Each control panel includes the following features:

a. An operation selector switch with one position for manual and another for automatic operation.

b. An emergency stop push button.

c. A speed selector switch with positions marked as follows:

Cage hoist—Rope Inspection, Shaft Inspection, Man Speed and Full Speed; skip hoists—Rope Inspection, Shaft Inspection and Full Speed.

d. A manual controller which provides speed control in each direction of travel.

Each hoist is also provided with a portable plug-in push button station with a raise and lower button and a suitable plug connected to the button by a portable cable. Receptacles to receive the plug are located at strategic locations in headframe and shaft stations and are used when changing ropes, installing ropes and handling large machinery on and off the conveyances.

One Man Operates Skip

Automatic control of the skip hoists by remote push button operation incorporates the following features:

a. Emergency stop push button at dump position and each level in the shaft where push buttons for automatic operation by push button are installed.

b. A start push button at each level in the shaft where push button operation is required.

c. The skip dump receiving feeder and belt conveyor system is interlocked so that the skips will stop if these pieces of flow sheet equipment are stopped. The interlock is in series with emergency stop buttons.

d. An interlock is provided to prevent starting of the hoist unless all pocket gates are closed.

e. Pocket gates are interlocked to prevent opening a pocket gate unless the skip is in position to receive a load.

f. An interlock is provided to prevent double loading of a skip.

Normal operation of this system involves the use of but one man at the present time. He is the skip tender who manually controls skip loading from a measuring pocket and sends the skip to the dump by pressing the start button. The skip proceeds to the dump, empties and returns to the same loading station automatically, whereupon the cycle is repeated.

Remote Control of Cage Hoist

Automatic control of the cage hoist by remote push button operation from each of 12 levels incorporates the following features:

a. A rotary type level selection

switch with 12 positions, each position to indicate one of the 12 levels.

b. A four-button push button station with the buttons in a vertical arrangement and with the following functions, reading from top to bottom button: Emergency Stop, Slow Raise, Slow Lower and Call, and a two-button station with the following functions: Hold and Release.

c. An interlock operated by the shaft gate.

d. A push button start switch which has a protruding metal head on the button and so located that it can be readily reached by a person standing in the cage. This button is mounted on the station plat.

pushes the hold button to prevent anyone else from taking control of its travel and then selects the level to which he wants to go by operation of the level selection switch. He then boards the cage, closes the shaft gate securely, and pushes the start button which causes the cage to travel to the selected level after a predetermined safety pause. Upon leaving the cage at the selected level, the rider must securely close the shaft gate and push the release button on that level so that the cage can be called by others wanting to use it.

The double deck cage is controlled so that it automatically stops at a level with the upper deck rails on the same level as the rails at the plat on that level. In order to bring the lower deck rails up to the level it is

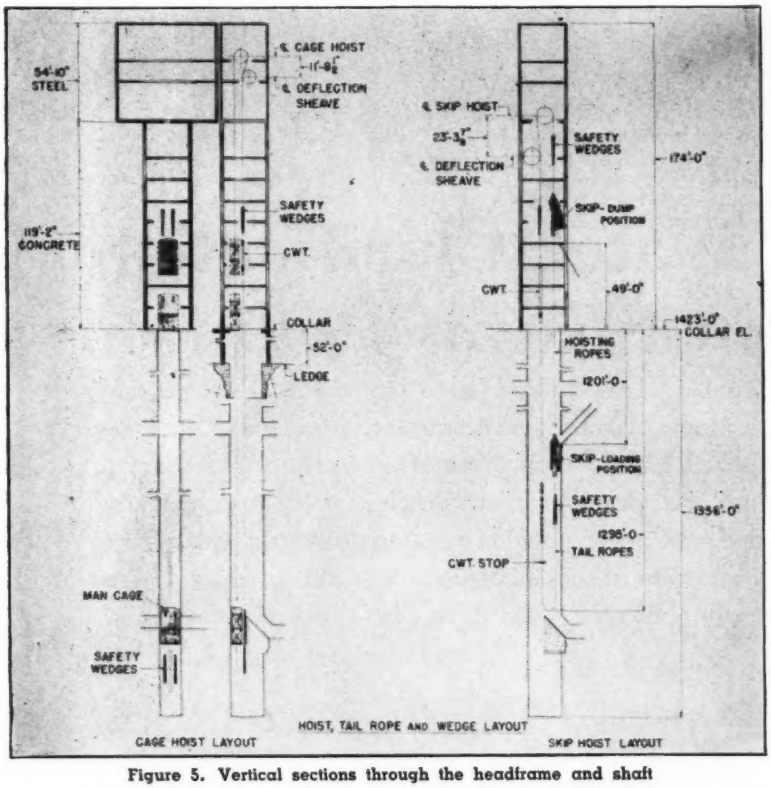


Figure 5. Vertical sections through the headframe and shaft

e. A seven-lamp station with indicating lamps in a vertical arrangement, labeled from top to bottom: Up, Down, Gates Closed, Available, Automatic, Manual and Men Speed.

In normal automatic operation the person desiring the cage pushes the call button, whereupon the cage comes to that level providing it is not already in use. It can be held there by opening the shaft gate or by pushing the hold button, whereupon it will stay at the level until someone on the level uses it or pushes the release button. Having secured the cage at his level, the person wishing to use it necessary to push the slow raise button on the level and hold it until the cage rises to the proper position, whereupon the button is released and the hoist travel stops. The cage may be lowered by operation of the slow lower button in a similar fashion.

The movement of the cage by operating these push buttons is effective only when the cage has stopped at the respective level and motion is limited to the level limits as established by the geared limit switches which initiate stoppage at the level. The speed attained is automatically held to a predetermined slow rate.

Opening of a shaft gate before the cage starts prevents it from starting. Opening of a gate when the cage is in motion reduces the speed to creeping speed and the cage then stops at the next level toward which it is travelling.

Pushing the emergency stop button at any level stops the hoist by shutting off power and applying the brakes. After such a stop, the button which was pushed has to be reset to start operation again. Then the cage is set in operation again by calling it to a level or by operation of the hold button and level selector and start switches as described above, depending on the position of the cage in the shaft when it was stopped.

Operation Observations

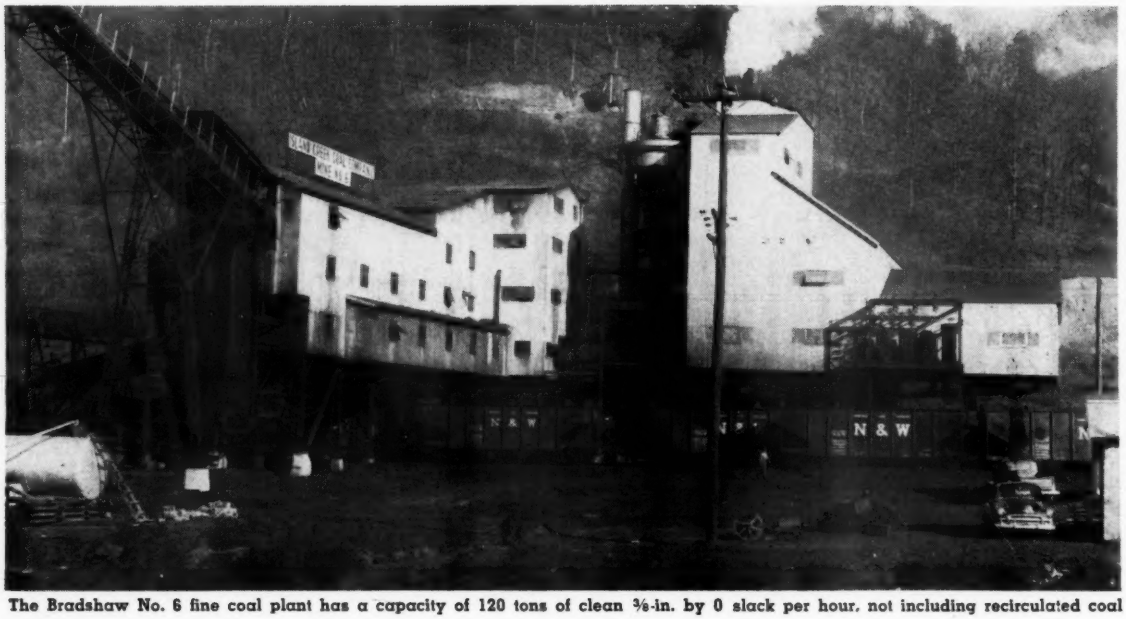
We think that operators are interested in learning how the Koepe hoists have performed for us during the past ten months of operation. We have hoisted as much as 4200 tons in a single eight-hour hoisting shift and as stated earlier, we have hoisted in excess of 500,000 tons of ore to date.

The unlubricated hoist ropes look perfect except for some mild scrubbing that occurred at their contacts with deflection sheaves during initial adjustment of brake application controls. Prior to installation of wooden rub bars, slight scrubbing of tail ropes on the steel around the bottoms of the counterweight compartments was observed. We make a monthly check on friction liner wear and the maximum total wear to date is $\frac{5}{32}$ in., which indicates replacement of the liners not less than every five years for present conditions. Rope equalization has presented no difficult problems. Initially we made a slight adjustment each month, but now we find a three-month interval is sufficient. The rope equalizers work perfectly and give us a visual indication of the tensioning of the multiple ropes.

The brakes, which are normally applied and released by air pressure, operate smoothly and positively. If air pressure fails, the brakes are automatically applied by weights and electric power is cut off.

The electric controls have functioned exceptionally well and, in spite of the complexities introduced by remote push button control, have caused no more operational trouble than we have experienced with other hoists which are operated by hoist operators at manual controllers in the hoist engine rooms.

Excellent coordination of electric control equipment with mechanical equipment, ingenius design and good workmanship on these hoists are factors which are particularly pleasing. Tempering our satisfaction with the knowledge that these hoists are new to us and that we have operated them a relatively short time, we have no hesitation in stating that we are well pleased with them in every respect.



The Bradshaw No. 6 fine coal plant has a capacity of 120 tons of clean ⅜-in. by 0 slack per hour, not including recirculated coal

Washery Water Clarification To Prevent Stream Pollution

With much attention being focused on the abatement of stream pollution, the problem of eliminating solids from washery water is of primary concern to the coal industry. This fine coal plant in West Virginia was designed and constructed to operate with a two-stage cyclone system followed by filtration to recover the maximum quantity of fine coal as a salable product. Plant bleed has consistently contained less than one percent solids

By MATHEW TURKOVICH

Director of Preparation
Island Creek Coal Co.

IN June 1948 representatives from the eight states in the Ohio River Drainage Basin, with the approval of their respective governors and legislatures, entered a compact agreement in which they pledged to cooperate in the control and abatement of stream pollution. Thus, the Ohio River Valley Water Sanitation Commission was formed. It is now known as Orsanco.

In 1953 the West Virginia State Legislature reconstituted and strengthened the State Water Commission Code. It requires that a permit be obtained before the construction of any new works which would cause a material pollution of the waters of the State. It also gives the commission legal authority to abate any pollution that takes place.

These actions created a real problem for the coal mining industry of the State. Realizing this, the State Water Commission has not, as yet, set up any rigid requirements for the elimination of stream pollution. Instead it has taken the attitude of being helpful and cooperative in the solution of the problem rather than using force. It has taken the stand that maximum elimination of stream pollution from preparation plants is best achieved through simultaneous cooperation by plant operators in a single watershed. This theory was first tested in the Coal River basin near Charleston. Results were gratifying.

As far as the coal industry is concerned, there are essentially two means by which the State waters can be polluted—(1) by acid water from the mines and (2) by the presence of solids in preparation plant washery waste water. Fortunately for the southern West Virginia coal field, and especially that area in which Island Creek Coal Co. operates, the mine water is not acid but alkaline with a pH of from 7 to 8. The pH in the water from the plant which is to be described has been 8.3. As a result acid pollution of the streams presents no immediate problem to us.

The problem of eliminating solids from washery water is the industry's primary concern and is not as easily done as it is sometimes believed. The topography of southern West Virginia

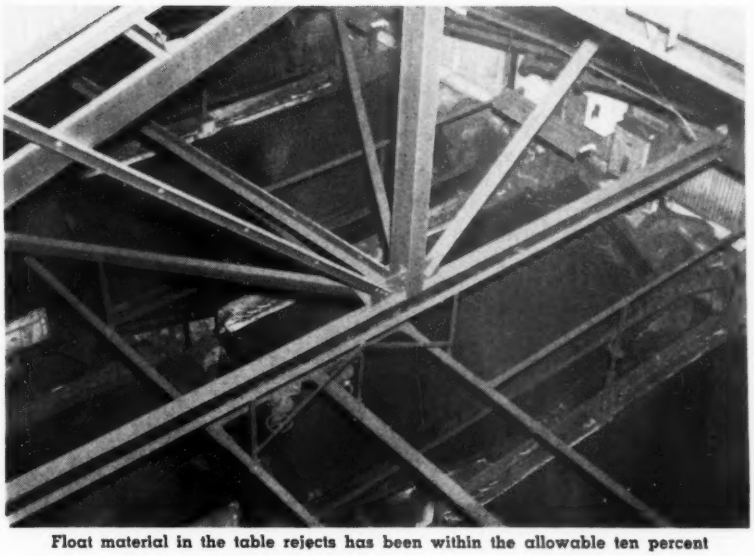
does not lend itself to the use of extensive settling ponds which are used in some neighboring states. Preparation plants are generally located in narrow valleys, and after the essential facilities have been constructed, there is very little space left for settling ponds. A system made up of filtration and fluoculation equipment can be very expensive.

Factors Influencing Design

The fine coal plant at Bradshaw No. 6, which is to be described, was designed and constructed to operate with a two stage cyclone system followed by filtration to recover the maximum quantity of fine coal as a saleable product. At the same time it permits recirculation of the water. Refuse from the cleaning tables is drained of its surplus water containing essentially minus 28-mesh solids. The water is collected and pumped through cyclones and the overflow is sent to a small settling pond. This plant bleed has consistently contained less than one percent solids. Under normal plant operation it has been less than ½ percent solids.

Before describing the water system which produces this low solids content discharge, something on the background of the plant may be interesting.

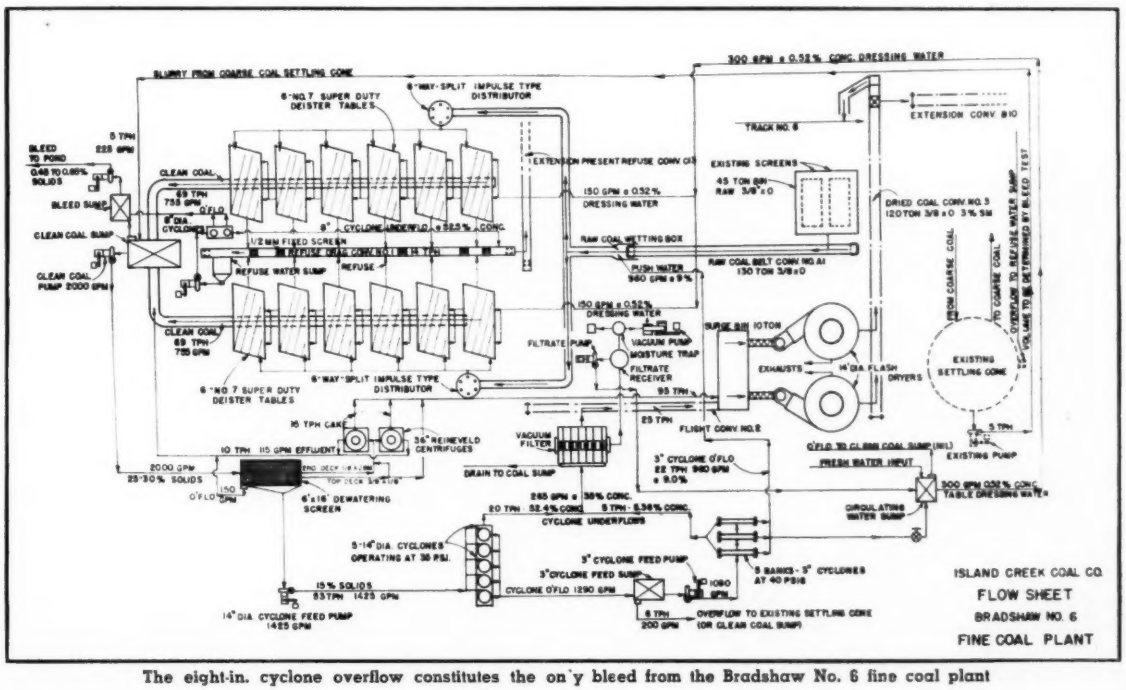
The Bradshaw No. 6 plant of Island Creek Coal Co. is located in the low volatile Pocahontas coal field of McDowell County, W. Va., about eight miles up Dry Fork Branch of Tug River from Iaeger. Island Creek acquired the property in late 1949 and a new coarse coal plant was placed in operation February 1951.



Float material in the table rejects has been within the allowable ten percent

In acquiring the high grade Bradshaw seam of Pocahontas coal, Island Creek management felt that it was not only a highly desirable domestic coal but that it had a place in the much desired metallurgical market. However, its acceptability had to be determined. To do this, arrangements were made to ship 420 tons of ⅜ in. by 0 slack per day to Island Creek No. 24 preparation plant, a distance of about 90 miles. Here the slack was washed to a uniform quality and thermally dried to a desired moisture content. This processing continued for about one year. The clean coal was shipped to various plants for full scale testing.

The market's acceptability was so favorable that we decided to construct a fine coal plant as an addition to the coarse coal plant and process ⅜-in. by 0 slack. Designs and proposals were received from several designing and constructing companies. All designs submitted were good. However, after due consideration was given each, the design submitted by Heyl and Patterson, Inc., Pittsburgh, Pa., was accepted. The plans were submitted to the State Water Commission and its approval for the construction was obtained. Construction began June 1955 and the plant was placed in operation November 1955.



The eight-in. cyclone overflow constitutes the on`y bleed from the Bradshaw No. 6 fine coal plant

Description of Coal Plant

The new plant has a capacity of 120 tons of clean ⅜-in. by 0 slack per hour. This does not include recirculated coal. Referring to the accompanying flow sheet, raw coal from a 45-ton surge bin is uniformly fed onto a 24-in. belt conveyor by means of a Jeffrey feeder. Coal is discharged into a wetting box. Here the coal is thoroughly wetted with 960 gpm of water containing about nine percent solids (overflow from three-in. cyclones). The mixture is then equally divided and flumed to two six-way impulse type Heyl and Patterson distributors.

Distributors were installed opposite each other at the sides and above the table room to give the operator a full view of each table on the floor below him. Each distributor uniformly feeds six No. 7 Super-Duty Diagonal Deck Deister Tables. Clean coal from tables is flumed to a clean coal sump. This sump also receives the slurry pumped from the coarse coal settling cone. A six-in. centrifugal pump, with a capacity of 2000 gpm at 80 ft tdh (total dead head), pumps the clean coal to a 6 by 16-ft de-waterizing vibrating screen equipped with ½-mm stainless steel decking.

Five batteries of three-in. diam. cyclones reduce ash from 11.7 to 9.5 percent

TABLE NO. 1

Reineveld Effluent
22.92% Solids

Size	% Wt.	% Ash
Plus 28-Mesh	10.0	3.31
28x48	39.3	3.48
48x100	16.6	3.94
100x200	10.7	5.04
Minus 200	23.4	19.58
Composite	100.0	7.47

Retained coal is essentially ⅜-in. by 28-mesh with about 25 percent moisture, while the underflow contains minus 28-mesh product. The ⅜-in. by 28-mesh product discharged from the vibrator is evenly split into two parts. Each part enters a 36-in. precision built Reineveld centrifugal dryer. The centrifuges are equipped with plates perforated with one-mm diam holes. Cake from dryers with about 6.75 percent moisture enters a ten-ton surge bin. The effluent (see table 1), containing essentially minus 28-mesh solids at about 22.92 percent water concentration, is piped to the clean coal sump for recirculation.

Cyclones and Flash Dryers

The underflow (see table 2) from de-waterizer, containing about 15 percent solids, is collected in a receiving pan under the vibrator. From here a six-in. centrifugal pump, with a capacity of 1425 gpm at 88 ft tdh, pumps the product at a feed pressure of 35 psi to a battery of five 14-in. diam cyclones. Underflow (see table 2) from 14-in. cyclones is piped to the vat of an eight-disc, 8 ft 10 in. diam vacuum filter. Stainless steel wire cloth, 40 by 60 mesh, is used on the filter segments. Overflow from the cyclones (see table 2) is sent to a small sump. Here about 200 gpm is allowed to overflow into the coarse coal settling cone to replace the water taken out of it with the slurry pumped to the clean coal sump. A six-in. centrifugal pump, with a capacity of 1100 gpm at 90 ft tdh, pumps the remaining product at a feed pressure of 40 psi to five batteries of 22 three-in. diam cyclones. Underflow (see table 2) from three-in. cyclones is piped to the vacuum filter.

TABLE NO. 2

Size	14″ Cyclone Feed 15.00% Solids 13.69% Ash % Wt.	14″ Cyclone Underflow 52.44% Solids 5.01% Ash % Wt.	14″ Cyclone Overflow 3″ Cyclone Feed 10.10% Solids 11.70% Ash % Wt.	3″ Cyclone Underflow 15.36% Solids 9.50% Ash % Wt.	3″ Cyclone Overflow 9.00% Solids 18.55% Ash % Wt.
Plus 28-Mesh	7.70	10.37	0.20	0.40	0.70
28x48	28.10	34.54	1.10	1.60	1.00
48x100	18.60	33.99	1.60	2.30	2.50
100x200	13.90	17.22	15.10	8.40	6.80
Minus 200	31.70	3.88	82.00	87.30	89.00

TABLE NO. 3

8-In. Cyclone Product

Size	Feed 11.33% Solids % Wt.	Feed % Ash	Underflow 52.50% Solids % Wt.	Underflow % Ash	Overflow 0.45% Solids % Wt.	Overflow % Ash
Plus 28-Mesh	23.31	47.13	23.46	49.67	0.96	41.38
28x48	40.33	40.28	40.92	36.72	7.10	41.38
48x100	24.90	48.60	24.40	40.88	8.54	40.99
100x200	8.54	60.23	8.57	58.78	15.26	34.08
Minus 200	2.92	54.33	2.65	64.26	68.14	40.32
Composite	100.00	46.06	100.00	43.63	100.00	39.51

Overflow (see table 2) is piped to the raw ⅜-in. by 0 coal wetting box and used to thoroughly wet the coal.

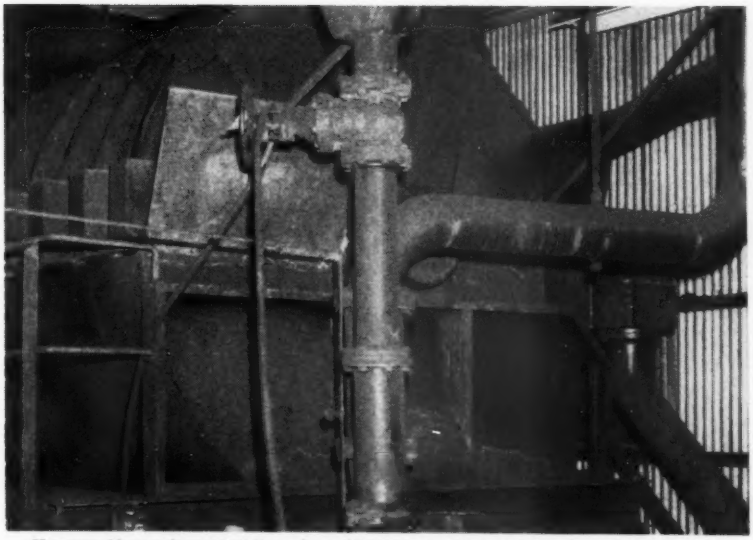
Vacuum filter cake containing about 25 percent moisture drops from the discs into a flight conveyor which distributes it uniformly into the ten-ton surge bin. Here the vacuum filter cake and the Reineveld cake are reasonably well mixed to provide a uniform moisture feed to the flash dryers. Vacuum filtrate, containing about 0.52 percent solids, goes to a filtrate receiver. From here it is pumped to a small sump from which dressing water for the Deister tables is obtained. When filtrate water is insufficient to provide enough water for the tables, fresh water is automatically added. The total amount of fresh water, obtained from a nearby stream, that enters the plant under normal operating conditions is about 150 gpm. This includes the make-up dressing water for the tables, cooling system at furnace and flash dryer and gland water at the various pumps.

Clean coal at the ten-ton surge bin when well mixed contains about 12 percent moisture. It is uniformly delivered by screw conveyors to the drying columns of two identical 14-ft Raymond flash dryers of 60-ton capacity each. Heat for the dryers is provided by burning dry, clean slack in a spreader-type furnace which has a capacity of 48,000,000 Btu per hour. Dryer column hot air temperatures vary from 800° to 1200° F. Exhaust air temperatures vary from 150° to 200° F. Surface moisture in the coal is reduced from 12 percent to about 3 percent in passing through the flash dryers.

Final Refuse Handling

Refuse from the Deister tables is discharged into a long six-in. pitch by 12-in. chain conveyor. Installed at intervals in the bottom of the conveyor are 14 fixed sections of ½-mm stainless steel bar screens which permits surplus water with solids, essentially minus 28 mesh, to drain from the refuse. This product (see table 3) is collected in a small sump which also receives intermittent overflow from the coarse coal settling cone. A four-in. centrifugal pump, with a capacity of 165 gpm at 84 ft tdh, pumps the contents at a feed pressure of 40 psi, to two eight-in. diam cyclones. Underflow (see table 3) from cyclones is discharged back into the refuse chain conveyor beyond the fixed bar screens and is taken away with the rest of the wet refuse.

The eight-in. cyclone overflow constitutes the only bleed from the fine coal plant. The solids concentration of this material is approximately 0.45 percent. Of these solids, about 90 percent will settle within one hour and ten percent will remain in suspension. The eight-in. cyclone overflow, which normally is about 50 gpm, is piped to a small sump. From here a four-in. centrifugal pump, with a capacity of 200 gpm at 40 ft tdh, pumps it to a small settling pond a short distance from the plant.



Vacuum filter cake containing about 25 percent moisture drops from the discs into a flight conveyor which distributes it uniformly into a ten-ton surge bin

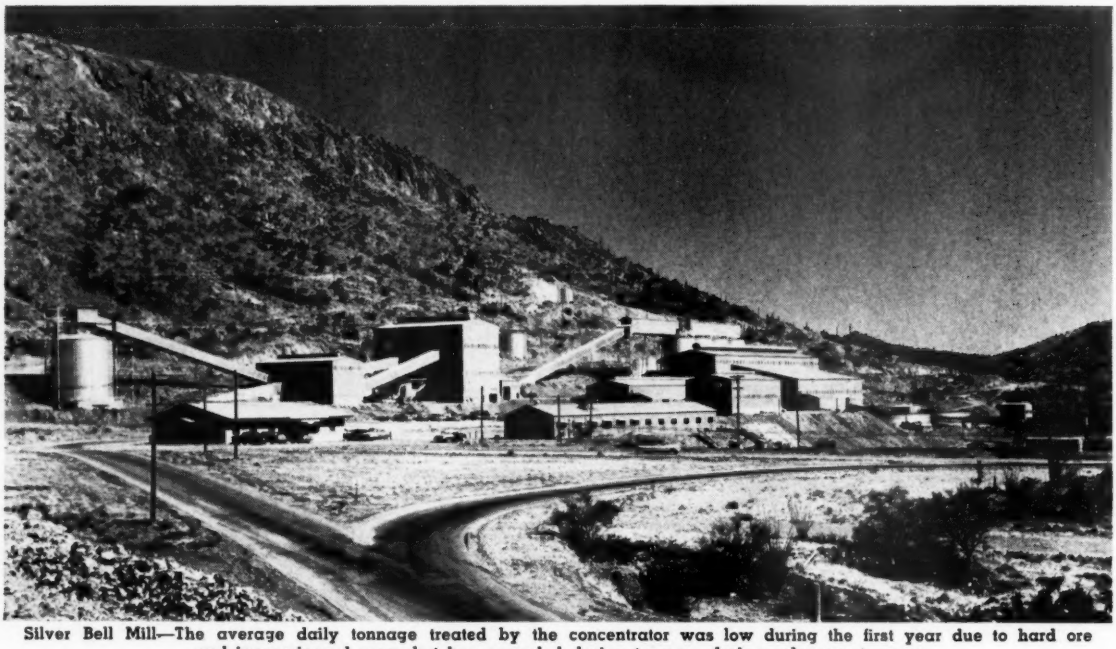
In view of the low percent of solids in the bleed going to the settling pond, it has been estimated the pond will last about four years. During this period any overflow from the pond to the nearby stream will contain about 0.045 percent suspended solids.

The fine coal plant at the Bradshaw No. 6 mine has been in operation a year. The usual "bug" period of a new plant made itself known. However, everything has been worked out satisfactorily and the plant is doing all it was designed to do. Ash in the clean coal is within expectation, averaging 4.75 percent. Float material in the table rejects has been within the allowable ten percent. Bleed from the plant amounts to about 50 gpm, far below the expected 210 gpm rate. The same is true of the 0.45 to 0.82 percent solids in the bleed. The waste water results are all the more gratifying when consideration is given to the softness of Pocahontas coal.

The pond into which the bleed flows is small because of existing natural conditions. However, its life is extended by the fact that such a small amount of solids enter it. Its overflow enters the Dry Fork Branch of the Tug River and contains suspended solids amounting to 0.045 to 0.082 percent of the discharge. This is expected to meet the State Water Commission's requirements. When the pond ceases to be effective another small one will be located within the plant area.

Small as it is, the settling pond at Bradshaw No. 6 is effectively cleaning up plant overflow

Silver Bell Pit Operation



Silver Bell Mill—The average daily tonnage treated by the concentrator was low during the first year due to hard ore and inexperienced crew, but has exceeded design tonnage during subsequent years

A concise report on an operation in Arizona that consists of two open pit copper mines and a 7500 ton per day concentrator

By D. R. PURVIS
Superintendent
American Smelting and Refining Co.
Silver Bell Unit

THE Silver Bell operation of American Smelting and Refining Co. consists of two open pit copper mines and a concentrator located about 40 miles northwest of Tucson in the Silver Bell Mountains.

The two pits, known as Oxide and El Tiro, are approximately 2½ airline miles apart in a northwesterly trending zone of hydrothermal alteration. Alaskite, dacite, andesite, and monzonite porphyry have been enriched by super-gene chalcocite to form the two ore bodies. The 7500 ton per day concentrator is located near the Oxide pit and four miles from El Tiro pit.

Initial stripping started in December 1951 and ore production started on March 1, 1954. During this time, over 13,000,000 tons of waste was removed from Oxide pit and over 2,000,000 tons of waste was removed from El Tiro pit, the concentrator was constructed, housing erected and related facilities constructed. Further details on development of the ore bodies, initial stripping, construction and history of the area are covered in a paper entitled, "Silver Bell Pit Development," by T. A. Snedden, manager, Southwestern Mining Division, American Smelting and Refining Co., which was presented at the American Mining Congress in 1954.

6,219,000 Tons of Ore Mined

At the time the Silver Bell project was started, delivery of equipment was very slow so it was decided to contract the stripping and initial ore production. A contract was entered into with Isbell Construction Co. of Reno, Nev., for stripping waste overburden from both pits and supplying ore to the mill for the first three years after start of milling operation. During the time that Isbell has been operating the pits, direct engineering

El Tiro pit—As of July 1, 1956, 6,219,000 tons of ore averaging 0.93 percent copper had been produced from both pits

and production control has been maintained by A. S. & R. Co. engineers, the contractor operating only where designated and producing only specified tonnages of ore and waste. The work performed by Isbell and the cooperation given has been excellent and has resulted in the very best relationship between company and contractor.

At the time production of ore started on March 1, 1954, the two ore bodies had a reserve of 32,000,000 tons of 0.9 percent copper. For the first year all production came from Oxide pit while stripping continued in El Tiro pit. Production from El Tiro pit started during March 1955 with a very small tonnage and increased to approximately ⅓ of total production by the middle of 1956. As of July 1, 1956, 6,219,000 tons of ore averaging 0.93 percent copper had been produced from both pits. The average daily tonnage treated by the concentrator was 6895 for 1954, 7676 for 1955 and 7730 for 1956, for an average of 7412 tons.

Asphalt Mat for Haul Road

Before El Tiro pit could be brought into production, a haul road had to be constructed to the concentrator. This road, four miles in length, was started in mid 1953 and the sub-grade completed by mid 1954. The road was formed for one mile on each end with waste from the two pits and in the central two mile portion by balancing cuts and fills. In order to obtain low haulage costs for this long haul, the road was designed with a maximum of 2½ percent grade, minimum radius of curvature of 1000 ft superelevations on all curves, and was surfaced with a 2½-in. mat of asphalt mix. The surfacing was laid in the summer of 1955 which allowed one year for settlement of fills. Total cost for construction of sub-grade and surfacing was just slightly less than $50,000 per mile. As of July 1, 1956, approximately 800,000 tons of ore had been hauled over the road mostly in Kenworth semi-trailer trucks with axle loadings up to 80,000 lb. There has been some localized failures due to over-rich mixture and wet subgrade, however, on the whole, the road is giving satisfactory service. Soon after the start of milling operations, laboratory work began on the recovery of molybdenite in the ore which averaged 0.015 to 0.02 percent MoS_2. This work indicated that an economic product could be made. Work was started on construction of a plant in late 1955 and was completed on May 1, 1956. As of July 1, 1956, the plant has been producing about 1500 lb of molybdenite concentrate per day.

Company to Do Own Mining

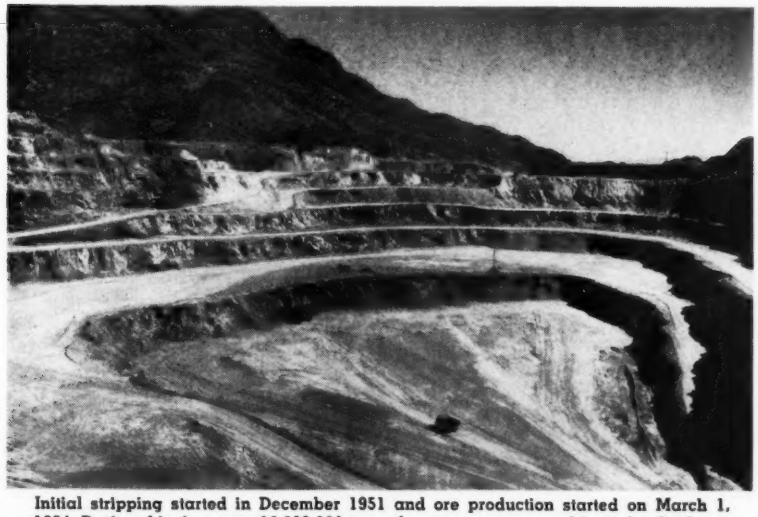
In the summer of 1955, with the expiration of Isbell's contract less than two years away, a cost estimate was prepared for operating the pits and approval to go ahead with the project was obtained in early 1956. The decision to take over the mining was based on the savings shown in the estimate and also on the desire of all concerned to have the company do its own mining, acquire the equipment and build up a staff competent to handle this type of mining.

The major equipment has all been ordered and consists of three 4½-yd electric shovels, thirteen 25-yd trucks and two 9-in. rotary drills. Orders have also been placed for other equipment such as a grader, dozers, service trucks and shop equipment.

For service and maintenance of equipment the facilities erected by Isbell Construction Co. have been purchased. These consist of a truck repair shop, warehouse, tire shop, change house, and underground fuel and lubricant storage system.

At the present time, there are 125 houses, 23 apartments and three trailer parks at Silver Bell. To provide additional housing a contract was let for the construction of 50 additional houses.

Silver Bell has been in production for about 2½ years. The tonnage mined and grade of ore has been very close to original estimates. The average daily tonnage treated by the concentrator was low during the first year due to hard ore and inexperienced crew, but has exceeded design tonnage during subsequent years. To date, no major difficulties have been encountered in either mining or milling and the operation has been continuous except for holidays and scheduled shut downs.



Initial stripping started in December 1951 and ore production started on March 1, 1954. During this time over 13,000,000 tons of waste was removed from the Oxide pit

About the Author

D. R. PURVIS was graduated from the New Mexico School of Mines in 1939 with a B.S. degree in Mining Engineering. He was employed by the American Smelting and Refining Co. at its Ground Hog Unit, Vanadium, N. M., in 1939 and progressed through engineering and production to superintendent in 1951. He was transferred to the Silver Bell Unit, Silver Bell, Ariz., as superintendent in 1952.

Surface rights determinations involve specific location and identification of mining claims on Public Lands

Administration of Public Law 167

New Public Lands legislation has not been easy for mining men to understand. The remarks that follow, taken from talks made by two men who have had key positions in the writing or administration of Public Law 167 —enacted July 23, 1955—will clear up many misconceptions as to its meaning and the procedures it requires

Viewpoint of the Bureau Of Land Management

By WESLEY A. D'EWART
Former Assistant Secretary of the Interior for Land Management

PUBLIC LAW 167 is a law in which I have some measure of personal pride; a pride which I am sure is shared by the American Mining Congress. It was my privilege to have helped draft the legislation that became Public Law 167 and to play a role in getting favorable attention from the Congress. It was also my privilege to have been a participant in the initial meeting—along with members of the American Mining Congress, the Forest Service, conservation groups, and others—that set the stage for this law.

That was a crucial meeting and we surprised even ourselves by the success of it. For from that first meeting of the minds on the general approach to a long-standing problem evolved the public law that President Eisenhower described as "one of the most important conservation measures affecting public lands that has been enacted in many years."

Very briefly Public Law 167 does the following things:

1. Amends the Materials Act of 1947 to prohibit future location and removal, under the Mining Laws, of common varieties of sand, stone, gravel, pumice (under two inches in size), pumicite, and cinders, by requiring disposition of these materials under the Materials Act.

2. Amends the Materials Act of 1947 to give the Secretary of Agriculture authority to dispose of mineral materials such as sand, stone, gravel, pumice, pumicite, cinders, and clay as well as vegetative materials such as yucca, manzanita, mesquite, cactus, and timber located on lands under his jurisdiction.

3. Amends the general mining laws to prohibit use of any mining claim located after the date of this Act for any purpose other than prospecting, mining, processing, and related activities.

4. Amends the general mining law to limit the rights of a holder of an unpatented mining claim, located after passage of this Act, in his use of the

surface and surface resources. To do this the Act gives the administering agency of the Government authority to manage the surface resources of the claim and to use so much of the surface as is necessary for management purposes or for access to adjacent lands.

5. Establishes a procedure whereby surface rights to invalid, abandoned, or dormant mining claims, located prior to the passage of this Act, may be expeditiously resolved.

Advantages to Miners

In other words, Public Law 167 provides the managing Federal agency with control of surface resources not needed in actual mining operations. Under the old law this was not clear. Another troublesome provision of the old law made it possible to locate mining claims for sand, gravel, cinders, pumice, and other common and widely occurring minerals. It was possible to establish claims for these low value minerals and acquire far more valuable surface resources, such as rich timberstands or a summer home or business site; or a water hold on grazing land. The new law corrected this source of abuse by removing the commonly occurring materials from the general mining laws and placing them under jurisdiction of the Materials Act of 1947.

Now, mining claims located after July 23, 1955, cannot be used for any purpose other than prospecting, mining, or processing operations. The Government retains the right prior to issuance of a patent to manage the surface resources of the claim, including the cutting and sale of timber, grazing of livestock, and use of the surface of the claim for access to adjacent lands.

The United States, or its permittees or licensees, however, will not be permitted to endanger or interfere with the operations of legitimate miners. The mining laws will continue to protect and reward the individuals who seek out and develop the Nation's hidden mineral resources.

Of major importance in our program to obtain fuller use of the public land resources is Section 5 of the new law. This establishes for the first time procedures for ending title uncertainties and determining surface rights on abandoned, dormant, unidentifiable, or invalid mining claims. Development of substantial areas in the West has been hindered and discouraged because of the difficulty encountered in determining the existence, much less the validity of old mining claims. Now the Secretary of the Interior is authorized to institute proceedings to establish the existence of old mining claims and then proceed to clarify and establish surface rights in a described area.

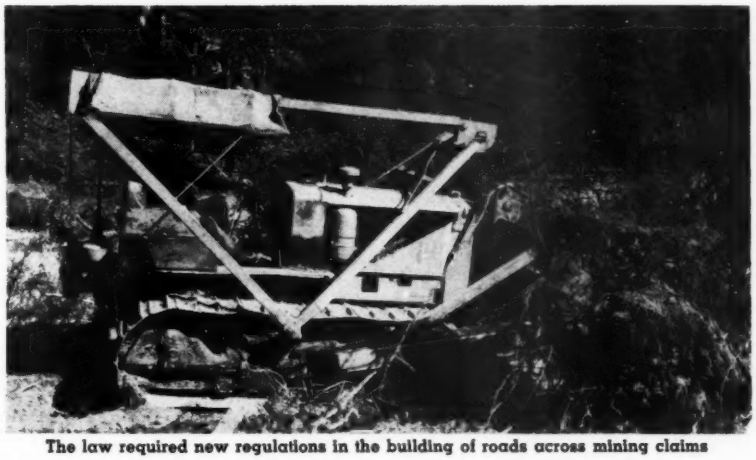
Obviously, this is an important and far-reaching law, and to implement it and to put it into operation has been a tremendous task. Regulations had to be written and promulgated, rules of procedure had to be established, field examinations had to be made, priority areas had to be selected, and many other things done.

Regulations Explained

During the time that I served as Assistant Secretary of the Interior for Public Land Management, the problems involved in getting Public Law 167 started were under continuous study and many of them were solved.

The Bureau of Land Management has examined about 250,000 acres of land, in accordance with Section 5 of Public Law 167, and expects to complete about 1,000,000 acres in fiscal year 1957, on which there are conflicts between mining claims and surface management.

Regulations have been prepared and published and signed by the secretary. Comments were received from the American Mining Congress and these comments and suggestions were found to be very helpful in the preparation of the final draft of the regulations.



The law required new regulations in the building of roads across mining claims

Numerous meetings have been held with the local and State mining associations in most of the Western States in an attempt to explain the provisions of Public Law 167 and to keep the mining fraternity informed as to progress and intentions under this Law. These meetings will continue and the Bureau of Land Management hopes to be able to give sufficient publicity to its activities under this law so that there will be no misunderstandings or misconceptions by anyone in regard to their rights under Public Law 167.

The Bureau of Land Management envisions approximately a 10-year program for the initiation and completion of the job before it. At the present time I am told that plans have been made, and areas selected for examination, through Fiscal Year 1960 only. Planning beyond that period will begin as soon as the program is well enough under way to allow a re-evaluation of present thinking and a firming-up of both present and future programs.

In REM Procedure

It has been generally known for many years that in large areas in the mining States of the West there were serious conflicts between mining claimants and other surface users of the public domain. However, such areas had never been specifically located and identified. Therefore, the first requirement of the Bureau of Land Management under Public Law 167 was the selection of these areas. Such a selection and determination has now been made in each of the eleven Western States and in the Territory of Alaska. Without going into specific details for each of these States, it appears sufficient to say that for Fiscal Year 1957 the Bureau has designated for examination 79 areas, involving approximately 3,300,000 acres. On this acreage it is estimated that there will be 54,000 mining claims and that some 24,000 verified statements would be filed which may result in some 2,800 hearings.

The areas selected, and on which action will be initiated under the *in rem* procedures of Public Law 167 for the determination of surface rights under the jurisdiction of the Bureau of Land Management subject to the operation of the Mining Laws of 1872, are those where the interference of unpatented mining claims is deemed to adversely affect the efficient and proper management of the lands. There are many areas of public domain under the Bureau's jurisdiction where the surface values or vegetative resources may not be sufficient to justify such an examination. On other areas there may be no interference or conflicts between unpatented min-

ing claims and other uses. On such areas, it is not contemplated that the use of the provisions of Public Law 167 will be necessary.

A second phase of the Bureau's operations consists of the examination of areas selected for identification of persons in actual possession. Very briefly, this examination is made not to determine the mineral character of the lands but to show the person or persons who are in possession or working mining claims within the area. Under this phase of the Bureau's operations under Public Law 167, there have been examined approximately 250,000 acres in Colorado, Montana, Utah, Idaho, Oregon, and California. Operations will begin in the very near future in the States of Wyoming, Nevada, New Mexico, Washington, and the Territory of Alaska; so that within the near future operations under the Law will have started in 10 of the Western States and the Territory of Alaska.

The third phase of the program consists of the mineral examination of all claims on which verified statements have been filed, the holding of necessary hearings, and rendering of decisions on the evidence presented.

Information Disseminated

A good share of the Bureau of Land Management's work to date, in connection with Public Law 167, has been the ordering of publications on areas examined by the U. S. Forest Service. At the present time the Bureau has authorized publication on 19 areas in the States of California, Colorado, Idaho, Montana, New Mexico, Utah, Washington, Oregon and the Territory of Alaska. This involves in excess of a million-and-one-half acres of land and an estimated 17,000 claims on which it has been estimated some 3100 verified statements will be filed resulting in approximately 1100 contests and hearings. However, our experience would indicate that the number of verified statements and consequently the number of contests and hearings will be much less than the original estimates. This applies to both Forest Service and Bureau of Land Management estimates.

It is the intention of the Department in all phases of operations under this law to give widespread publicity and information to the mining industry in order that there will be no misunderstandings or misconceptions as to the rights or privileges of the claimants. I trust that by making this information available, and by personal contacts with the Mining industry, the excellent relationships previously built up can be maintained and improved.

Viewpoint of the U. S. Forest Service

By EDWARD P. CLIFF
Assistant Chief, Forest Service
U. S. Department of Agriculture

THE PRESIDENT referred to Public Law 167 of the 84th Congress as one of the most important conservation measures affecting public lands that had been enacted in many years. We think so, too. The credit goes to the cooperative work of many people—the Congress of the United States, the American Mining Congress, the American Forestry Association, the Departments of Agriculture and Interior, and many other people interested in multiple use of our national forests and public lands. It has been a cooperative job from the start; and we plan on keeping it that way. It's a "double jack" proposition!

In preparing field instructions for administering this law, the Forest Service consulted frequently with representatives of the mining industry and the Department of the Interior. Advance copies of our regulations and instructions, and the leaflet "What is the Multiple-Use Mining Law?", were furnished to the American Mining Congress staff, and the Department of the Interior for review and comment. Their comments and suggestions were most helpful.

As soon as it appeared that the bill would pass, the Department of Agriculture requested an appropriation of $300,000 to start the program of determination of surface rights on mining claims as specified by Section 5 of the Act. Congress responded by appropriating that amount to administer the law the first year.

Eight areas in the six western regions were selected in the initial plan for examination and determination of surface rights. These areas were considered of high priority for early examination because of complicated land use management problems. In some areas old abandoned, dormant, or inactive claims existed along with active claims. Field work on all of these areas has been completed and the 150-day publication of notice was begun in March and April 1956.

Field Examination

In the field examination work under Sec. 5 of the new law, each member of the crew is assigned a specific area to be examined. Before he goes into the field, topographic maps and aerial photographs are studied and used in making a plan for detailed examination. All reasonably available data and information on current mining activity in the area are assembled so that by the time the crews are ready to start a field examination they have a fairly good idea of the job, where to go and what they might find. The first job is to explore all trails or roads which may give a clue to mining activity. All posted notices, timber cuttings, blazes, or other signs of recent work are mapped and noted. On finding an indication of occupancy or mining, an effort is made to find the actual workings, and old workings are investigated for evidence of recent activity. New timber sets, new muck on a dump, newly used tools or equipment, and recent timber cuttings for mine props or lagging are noted. All cabins are checked for occupancy and ownership. The examiner usually visits with local residents and discusses recent mining activity in the area. He explains what he is doing and why he is doing it. So far most local residents and prospectors have been helpful to field crews. This cooperative attitude of the miners is reflected in the large number of waivers that have been given to the Government under the provisions of Sec. 6 of the new law.

As the search progresses, field notes are jotted down at each finding of new evidence or information that establishes the occupancy or recent working of a claim. These notes form the basis of the examination report.

Following the ground search the field examiner prepares an affidavit of what he did and saw on this selected area. These affidavits are reviewed by the general counsel's office for legal sufficiency. For the first eight areas completed by July 1, 1956, there were 90 such affidavits. Evidence of recent work was found on some 260 claims; but the field crews were unable to find the names and addresses of the claimants to about 80 of these claims. Six persons were actually found working their claims in a total area of some 575,000 acres examined. Information from the county records indicated that there were over 7000 claims filed on these areas. In other words, our crews

Administration by the Forest Service of surface rights on mining claims in the national forests requires an understanding of timber management

found that the claimant was in actual possession or working his claim on about three out of each 100 claims.

Surface Rights Determined

The tract indexes of each county, where a determination of surface rights procedure is being processed, are then searched for any record affecting the land being examined. Upon completion of the field examination, a request is made to the Department of the Interior for publication of notice to mining claimants, for determination of surface rights. This request contains a description of lands to be covered, affidavits of examination and a certificate of examination of the tract indexes. Within 15 days after the date of the first publication of notice a copy of the notice is mailed, by registered mail, to each person found in possession or working a claim, to those recorded in the tract indexes of the county records, and to those who have filed a request for such notice in compliance with Sec. 5(d) of the Act.

The first area for which the 150-day publication period was completed is a 7000-acre area containing about 115 claims in the Bitterroot National Forest in Montana. Not a single person asserted rights by filing a verified statement in this area. The 150-day publication period has since been completed in three additional areas and approximately 20 verified statements have been filed covering 133 claims. Each claim for which a verified statement has been filed must be examined by a qualified mineral examiner.

If the results of the examination are such that the Forest Service believes the claim is valid, then there are no grounds for contesting the asserted rights and the Forest Service will inform the Bureau of Land Management to that effect and no hearing will be necessary. On the other hand, if the results of the examination of a mining claim by a qualified mineral examiner are such that the Forest Service believes the asserted rights are invalid, a hearing will be held before the Bureau of Land Management hearing officer. The BLM will make the final determination of the validity of the asserted rights. So far there have been no such hearings.

Considerable progress already has been made in field examinations to determine surface rights. In addition to the eight areas mentioned above, approximately 3,000,000 acres on 37 areas in 11 States and Alaska containing about 31,500 claims have been examined. Additional areas have been selected for next year and we will again concentrate our efforts where a determination of surface rights will actually result in improved multiple use management.

Give and Take

The Act of July 23, 1955, has not been on the books long enough for us to fully evaluate the sort of day-to-day jobs and problems that will develop out of the provisions of the law dealing with the general management and protection of the national forest surface resources. We want to harvest the timber in a normal manner as part of the Timber Management Plan and not speed up or direct cutting to get there first. The same philosophy must also apply to the use of other resources such as hunting or fishing by the public, stock grazing, and the building of roads. I can visualize some disagreements in what constitutes "interference" to mining operations where hunting, stock grazing or road construction are concerned, but I believe these disagreements will mostly be confined to personalities rather than judgment or misunderstanding of the meaning and intent of the law. These disagreements must be settled largely on the ground between the ranger and the miner. I imagine it is going to require a little give and take on the part of both and a good understanding of each other's responsibilities and rights under the law to avoid local squabbles.

An assay of where we are in the administration of the Act of July 23, 1955, will show that the general public, the miners and Forest Service people appear to have a good working knowledge of the law. To my knowledge our relationships with the miners on the ground are as good as those we enjoy with the American Mining Congress.

We have organized and trained our field people to do the planned job of field examination and determination of surface rights in the time proposed. Actually we are a little ahead of schedule.

Fitting the new law into the complex of existing laws, regulations and policies governing the management of national forest lands has been accomplished.

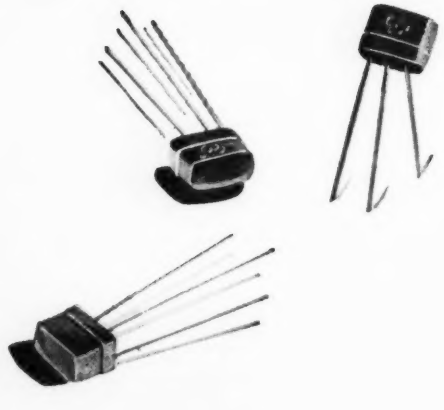
The Government has the right to manage surface resources of unpatented claims located after enactment of Public Law 167

Sulphur

helps to create
Headline Products

Not too long ago this relatively rare metal was a laboratory curiosity. What to do with it? Today, it's the heart of the tiny transistor—the latest giant of electronics!

GERMANIUM



What's the connection between Sulphur and Germanium?

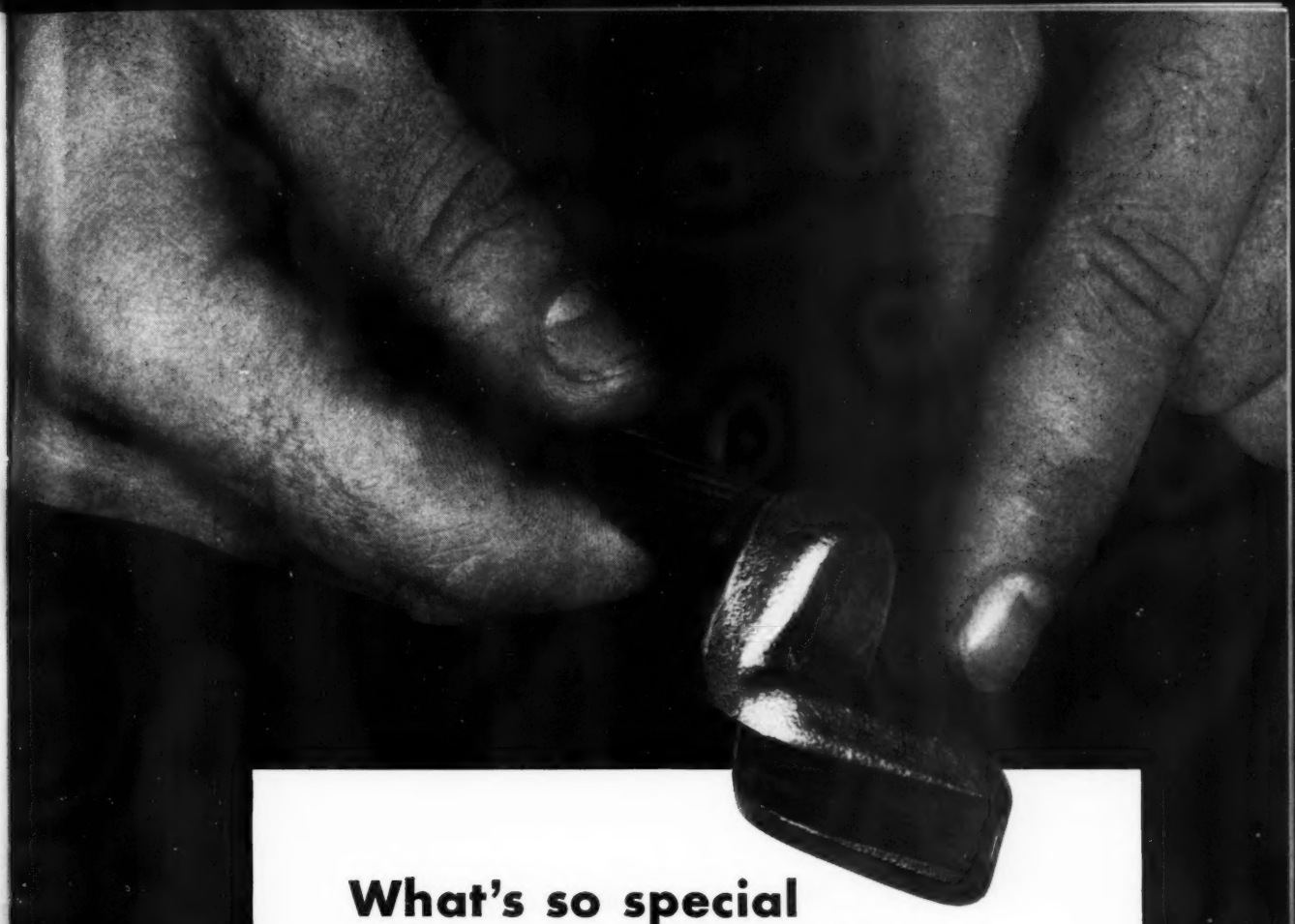
There are two, in fact. One is man-made, involving the routine leaching of Germanium ores with Sulphuric Acid prior to tetrachloride distillation. The other takes advantage of a peculiar property of the natural mineral, Germanium Sulphide. This mineral can be volatilized and then sublimed, providing an effective method of separating the Germanium from gangue material. The process is called "Concentration of Germanium by Sulphide Sublimation".

Again Sulphur, through its major derivative, Sulphuric Acid, and a natural sulphide play an important role in our ever-expanding economy. It is difficult to find many items in the broad chemical-metallurgical field that do not somewhere along the production line make use of Sulphur or a derivative.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.
811 Rusk Avenue, Houston 2, Texas

Sulphur Producing Units
- Newgulf, Texas
- Moss Bluff, Texas
- Spindletop, Texas
- Worland, Wyoming



What's so special about this terminal?

What's so special about the terminal of this AW-22 rail bond?

A bond welder could point to several things.

For example, the husky "clip" that allows him to set the bond firmly in place with a couple of hammer blows.

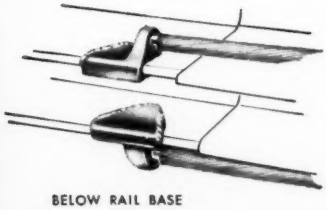
Or the broad flanges that give him room to build up a solid weld between terminal and rail.

Or the easy accessibility of the weld area, whether he's installing the bond above or below the rail base or using it for cross bonding.

These are just a few of the many features that help him do a *better* job *faster* with the AW-22 bond.

See your No. 27 Catalog, or write us direct, for more information on the AW-22 and other fine O-B bonds.

ABOVE RAIL BASE



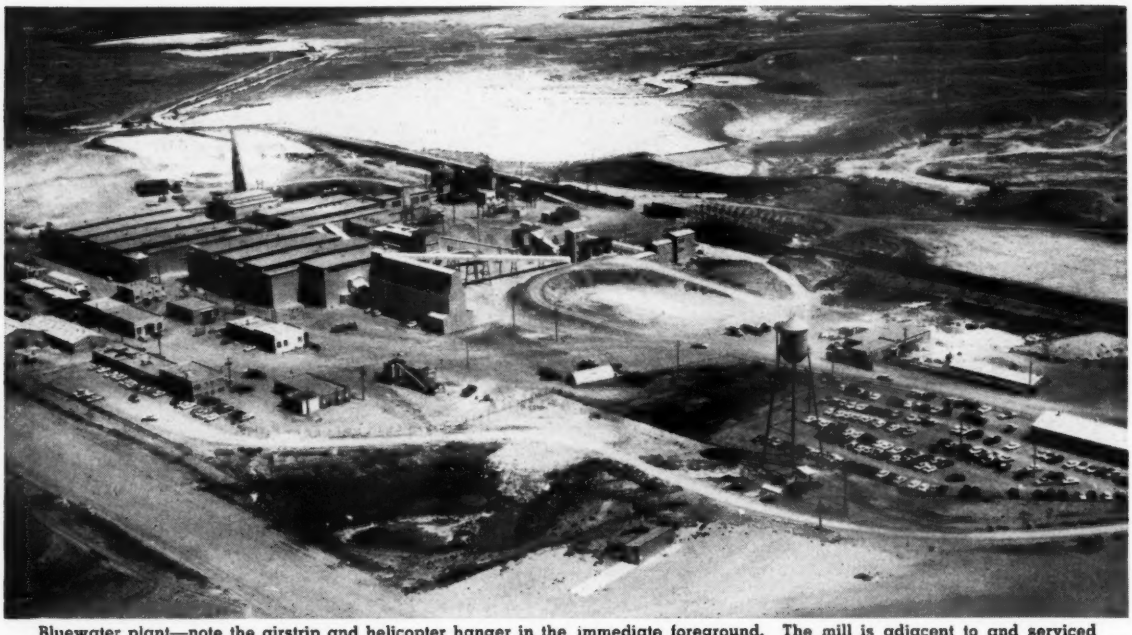
BELOW RAIL BASE

Ohio Brass

MANSFIELD OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4710-M



Bluewater plant—note the airstrip and helicopter hanger in the immediate foreground. The mill is adjacent to and serviced from U. S. Highway 66 and the mainline of the Santa Fe Railway

Uranium Milling at The Bluewater Plant

This resume of the several programs of expansion and diversification of ore treatment at the Bluewater plant since 1954 covers the expansion of alkaline leaching facilities, construction of a crushing, grinding, acid-leaching and resin-in-pulp mill, and the revamping and enlargement of the limestone crushing plant

By E. C. PETERSON and D. C. MATTHEWS
Assistant Manager Chief Metallurgist
The Anaconda Co., Grants, N. M.

SINCE August 1954 the New Mexican operations of The Anaconda Co. at Bluewater have undergone several programs of expansion and diversification of ore treatment to attain the present full stature and capacity. This receiving station and milling operation of the company is located ten miles west of the town of Grants and is adjacent to and serviced from U. S. Highway 66 and the mainline of the Santa Fe Railway that parallel the property to the south.

Alkaline leaching facilities were expanded to more than double capacity during late 1954 and early 1955. The new continuous-leaching and Oliver-filtration section of the carbonate mill was placed on stream and in full operation before mid-March 1955.

Construction of a completely integrated crushing, grinding, acid leaching, and resin-in-pulp mill was started in the fall of 1954. This mill was completed and the first section placed in operation December 5, 1955. The second section went on stream early in January 1956.

A complete revamping and enlargement of the old limestone crushing plant was completed March 29, 1956. This includes complete cross-over arrangements between the two crushing plants and provides bypass flexibility of operation in the crushing and disposition of ores to the bins of each mill or to the stockpiles.

Crushing

With the exception of double-impeller impact crushers, preparation and sampling of the ores for milling conform to flowsheets and equipment that are conventional and suitable for size-reduction to minus ⅝ in. for sandstones and to minus ⅜ in. for limestones as feed for rodmill grinding. Dust collection during crushing is accomplished by Rotoclones that create a total air flow in excess of 71,000 cfm. Dust recovery is made at a central thickener and delivered to the leaching-circuit of the carbonate mill.

Carbonate Mill

After grinding and cyclone-classification in hot recycle carbonate-bicarbonate solution, leaching in the carbonate mill is accomplished, in six sweep-agitated autoclaves in series, at 250°F. and 30 psig pressure and employing $KMnO_4$ and MgO as additive reagents.

Hot leached pulp is flashed to atmospheric pressure in air-lift agitator tanks and from which pumps deliver the pulp batch-wise to five 5 by 40-ft Burt pressure filters and continuously to three 11½ by 18-ft vacuum drum

filters operating in series. Conventional washing with recycle filtrate, barren leach solution, and hot water is practiced. Tailings are repulped in water for disposal.

Pregnant carbonate solution is precipitated by addition of caustic soda in excess and the precipitated sodium diuranate is recovered in plate-and-frame filter presses. The barren filtrate is regenerated by carbonation using flue-gas from the process steam and power boilers of the power plant.

Acid Mill

In the acid mill, open-circuit grinding in lightly charged rodmills is sufficient under ordinary conditions for reduction of the Jackpile sandstone ore to all minus ten mesh in preparation for mechanical handling and leaching of the pulp.

With the aid of manganese dioxide, dissolution of the uranium minerals is accomplished by sulphuric acid leaching in a series of 14 agitators. Sand-slime separation of the leached pulp is made in rake and cyclone classifiers. The sand fraction is washed countercurrently and discarded directly to tailing. A low-solids all minus 325-mesh slime fraction is separated as a suspension in the rich or pregnant liquor of the leach. This pulp is then adjusted to the proper pH and emf potential for ion-exchange extraction of the uranium oxide by the resin-in-pulp process.

Uranium is extracted from the solution of the pulp by ion-exchange on strong-base anion resin. The resin is retained in four-ft cubical baskets that conform in general to the Walker-Lybarger design. A welded framework of Carpenter 20-Cb stainless steel is panel-covered with Carpenter 20 Tyler 147 Ton-Cap screen cloth secured by stainless steel bolts and maple angle-bats and stripping.

Fourteen RIP (resin-in-pulp) banks of ten baskets each comprise an ion-exchange section of the mill. At present each basket contains 15 cu ft of wet settled resin. Up and down movement of the baskets, in the pulp or eluting solution and within cell-like cross and longitudinal baffling, is imparted through a fixed-end sprocket-and-chain suspension from a line-shaft that is radially reciprocated in simple harmonic motion by a connecting-rod arrangement from an adjustable crank on a speed-reducer V-belt drive. Speed variations and variations in length of stroke may be obtained by sheave changes and by changing the throw of the crank.

At present ten banks are used for loading (exhaustion) or extraction of the uranium from the pulp, and four banks are on elution for the removal of the uranium loaded on the resin. Four sumps below floor level collect the final and secondary or recirculation products of ion-exchange for delivery to process destination.

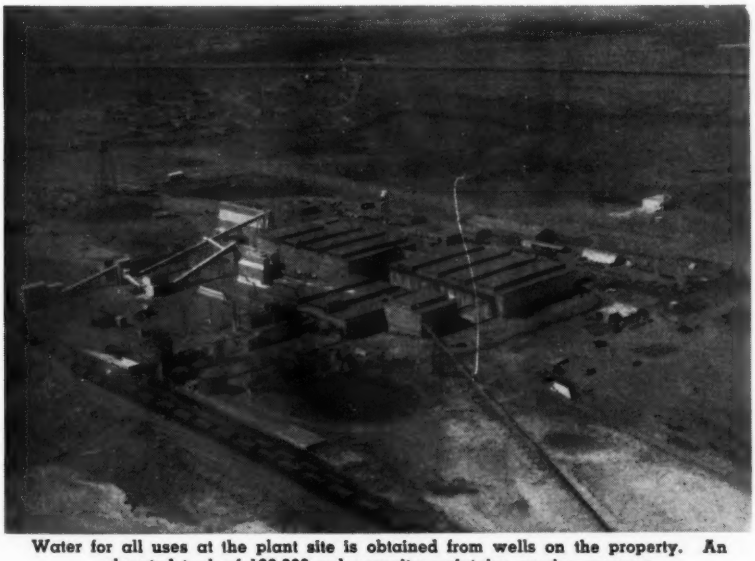
After partial neutralization with lime, the pregnant eluate is clarified in plate-and-frame presses. Neutralization of the clarified pregnant solution with MGO precipitates the uranium as a diuranate. The precipitated neutral solution is pumped to plate-and-frame presses in the yellow-cake section for recovery of the uranium precipitate. Barren filtrate is returned for makeup of new eluting solution.

Yellow-Cake Section

Filtration of uranium precipitates and the drying, packaging, and shipment of yellow-cake are all conducted within a security area common to both mills. However, the operation of these steps is separate and distinct for carbonate yellow-cake and for acid yellow-cake.

Filter-cake is thick-pulped and dried on double-drum steam dryers that discharge directly to shipping drum through pant-leg chutes and dust closures. Dust collection systems are

(*Continued on page* 63)



Water for all uses at the plant site is obtained from wells on the property. An elevated tank of 100,000 gal capacity maintains service pressure

About the Authors

E. C. Peterson

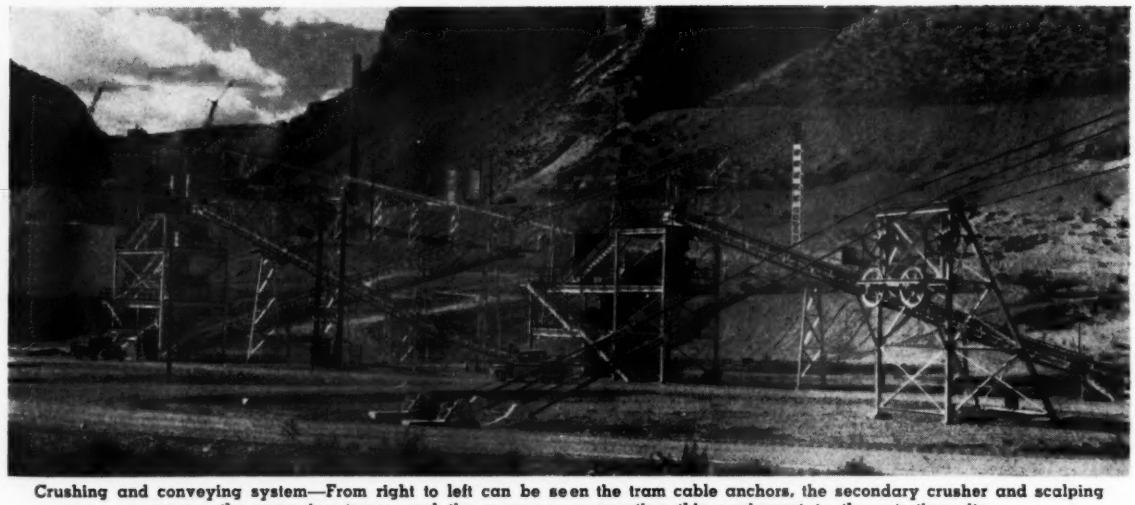
D. C. Matthews

ERNEST C. PETERSON is a graduate of the University of Utah in Mining and Metallurgical Engineering. He was a field metallurgist for Guggenheim Brothers in the United States, Mexico, and Australia. He spent three years in Mexico with Cia. Minera Asarco.

With various divisions of The Anaconda Co. for 22 years, Peterson served as a chemist, junior metallurgist, metallurgist, and concentration engineer in the Salt Lake area of International Smelting & Refining Co. at Tooele, Ophir, and Nevada operations. He was mill superintendent at the Darwin Mines. He served on various minerals beneficiation assignments with the exploration department and in the Montana and Idaho operations before going to Grants, N. M., in 1954 as general mill superintendent. Now Peterson is assistant manager of the New Mexico Operations.

DALE C. MATTHEWS has worked at nearly every phase of mining, milling and construction. He has held the position of general superintendent of The Galigher Co., AEC contract at Monticello, Utah; mill superintendent of Utah Construction Co., Korean project contract at Sang Dong, Korea; general superintendent of Benjamin Franklin Graphite Co., operations at Chester Springs, Pa.; general superintendent of The Five Points Mining and Milling Co., Inc., at Fairfield, Idaho; and general superintendent of Gold Bug Mining and Milling Co. of Silver City, Idaho.

Other major positions held by Matthews were as follows: mill superintendent of Ely Valley Mines, Inc., at Pioche, Nev.; smelter foreman of Bradley Mining Co. operations at Stibnite, Idaho; mill superintendent of Custer Consolidated Mines, Inc., at Sunbeam, Idaho; and metallurgist for Talache Mines, Inc., at Atlanta, Idaho. At present he is chief metallurgist for The Anaconda Co., New Mexico Operations, Grants, N. M.



Crushing and conveying system—From right to left can be seen the tram cable anchors, the secondary crusher and scalping screen, the screening tower, and the conveyors connecting this equipment to the retorting site

Oil Shale Mining and Retorting Methods

A discussion of an oil shale research project outlining some of the problems that are involved in pioneering the development of a vast but untouched natural resource of the United States

By FRED L. HARTLEY and G. H. HEMMEN

Respectively, Vice-President and Chief Engineer
Research Department
Union Oil Co., of California

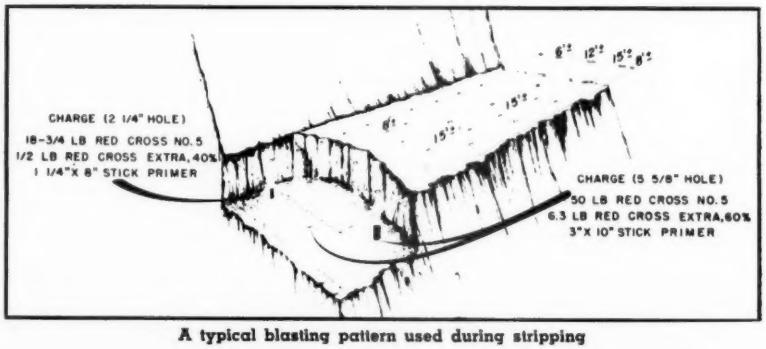
TO begin, it is well to recall briefly the objective of our shale research project. In May 1955 Mr. W. L. Stewart, Jr., vice-chairman of Union Oil's board of directors, emphasized at a meeting in Grand Valley, Colo., that we were spending our money to find the answer to just one question: Can we produce merchantable shale oil at a cost low enough to make it competitive with petroleum?

To answer this question, Union Oil Co. is carrying out research in two areas. First, it is studying methods for producing commercial products from shale oil with the objective of determining the most economic refining steps. This work is under way in the laboratories at Brea, Calif. Second, it is building a retorting plant and operating an oil shade mine in Colorado with the objective of proving out the Union Oil retort at full-scale operating level. This work constitutes the company's major research effort.

What is oil shale, and where is it found? Oil shale is neither a true shale nor does it contain oil. It is tough, strong rock that is known to geologists as marlstone. It contains from 10 to 20 percent solid organic matter that can be decomposed by heating to yield raw shale oil.

The most important deposit of oil shale in the United States is found in the Piceance Creek basin of northwestern Colorado about 200 miles west of Denver. The United States Geological Survey estimates that the deposit, which is about 25 miles wide and 40 miles long, can yield 500 billion bbl of oil, of which 100 billion bbl, three times present United States proved crude oil reserves, are contained in the rich band known as the Mahogany Ledge. Last February the Geological Survey reported the existence of an additional oil shale deposit which underlies this deposit. This second deposit may well cause us to double these remarkable oil reserve figures.

To make commercial products from oil shale, three steps are necessary. They are mining, retorting, and refining. Mahogany Ledge oil shale can be mined in a conventional manner and with conventional machines. The Bureau of Mines in its work at Rifle, Colo., demonstrated such mining on a



A typical blasting pattern used during stripping

commercial scale for several years prior to its shutdown early in 1955.

Retorting consists of heating crushed oil shale to decompose the organic matter. Many attempts have been made to develop a successful retort to do this. During the period 1850 to 1945, over 1250 patents were issued on the retorting of oil from shale, yet it is significant that there are no commercial retorts in use in the United States today.

There are, however, oil shale industries in operation abroad. In Sweden, Scotland, and Germany liquid fuels are being produced from oil shale. But because of local economic conditions, military security, etc. the technology used in these operations cannot be competitively employed in the United States.

It is our opinion that the retorts which show the most promise for the United States' shale deposits are those developed individually by the Bureau of Mines and the Union Oil Co. Union Oil's shale research project has as its primary objective the large-scale testing of the Union retort.

Quarry-Type Mine Developed

Our shale demonstration plant is being constructed about ten miles north of Grand Valley, Colo., near the intersection of the East and Middle Forks of Parachute Creek. We have also developed a quarry-type mine along the face of one of the oil shale cliffs. Our mining contractor, the Isbell Construction Co. of Reno, Nev., has been active in scaling and stripping work and other mine development since late in 1955. We are now mining oil shale preparatory to the shake-down operations of the retorting plant.

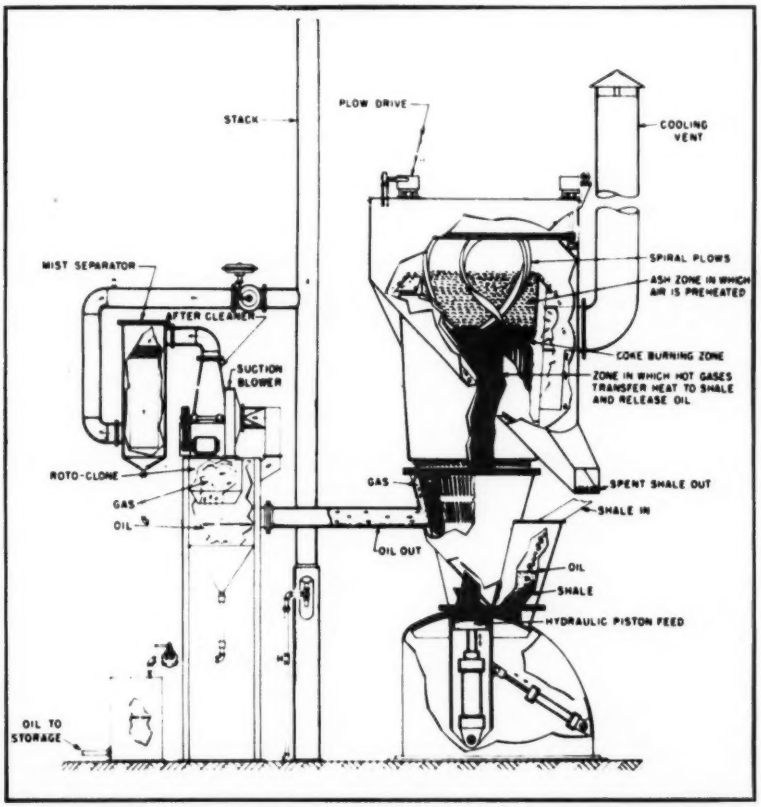
To develop the mine it has been necessary to do extensive scaling and stripping of weathered rock. The mine is being developed along a 1000-ft open face. Stripped and scaled material has been cast down the mountain side, forming a wide rock slide. The mountain slope above the shovel level has been scaled free of badly weathered rock, and stripping has taken place in a benching operation down the mountain side for a distance of over 100 ft.

To open up the wide bench about 1000 ft long at the Mahogany Ledge level, it has been necessary to remove about 450,000 yd of dirt, rock, and low grade shale.

Conventional Mining Plan

Our quarry mining plan is conventional. We expect to drill and blast, and then to shovel-load into trucks for carrying to the crushing system. Depending upon the quality of oil shale desired for our operation, we will mine in 10- to 30-ft benches, advancing across the mine face.

In a typical blasting pattern, a combination of wagon and rotary drill holes is bored to a depth of 12 ft in three rows across a bench about 40 ft wide. The holes are charged with Red Cross No. 5, free running bag powder, and Red Cross extra, stick primer. Seventeen milisecond delays



The retort being built for the demonstration plant will have a feeding piston of 5½ ft in diameter and will stand some 50 ft high. Its capacity will be in excess of 300 tons per day

About the Authors

F. L. Hartley

G. H. Hemmen

FRED L. HARTLEY joined the Union Oil Co. in 1939 as an engineering trainee, shortly after he graduated from the University of British Columbia with a degree in chemical engineering. In 1942 he became manufacturing process supervisor, and in 1950, general superintendent at Union's major Los Angeles refinery. Three years later he transferred to the research department to head up the newly formed commercial development division, and in 1955 he was promoted general manager of the research department. He was elected vice-president in 1956.

Hartley has directed the Union Oil Company's comprehensive oil shale research and development program since its inception at the beginning of 1955. In the summer of 1955, he spent seven weeks in Europe, studying at firsthand, oil shale experiments and operations in Germany, Scotland, and Sweden.

G. H. HEMMEN was graduated from the University of Washington in 1937 with an M.S. in Chemical Engineering. Employment with Union Oil Co. of California began in 1937 as a chemist at the Los Angeles refinery. Following a transfer to the research department in 1938 as a chemist, there were a number of assignments as an engineer in the manufacturing department, both at Oleum refinery and head office. In November 1941 he became assistant superintendent of distillation at the Los Angeles refinery. During World War II he spent about two years in New York and Washington, D. C., as a company representative on engineering and priorities problems. He returned to Oleum refinery in 1944, and in 1946 was assigned refinery manager. He became chief engineer and was appointed to the research department at Brea, Calif., in October 1952.

are used between the first and second, and the second and third rows. Shots break about three ft below the bottom of the holes resulting in a load ratio of 0.45 lb of powder per cu yd of burden.

Various shot patterns and types of explosives have been tried during the stripping operation. The use of this drilling pattern, procedure, and type of explosive resulted in the least amount of damage to the rock faces and benches above the shots and gave the fewest slides. At the same time, rock is adequately broken for ease in handling. A different shot pattern and loading ratio are being developed for the mining operation now under way. Experimenting is still going on so that no typical pattern is finalized at this time.

Although we are obtaining oil shale by the open-face method, we have not ruled out the possibility of subsequently doing some underground mining. After a sizable amount of shale has been removed by the quarry method, we may wish to try an underground operation. This decision, however, will be faced later, since the first objective is to prove out retorting, not to develop mining methods.

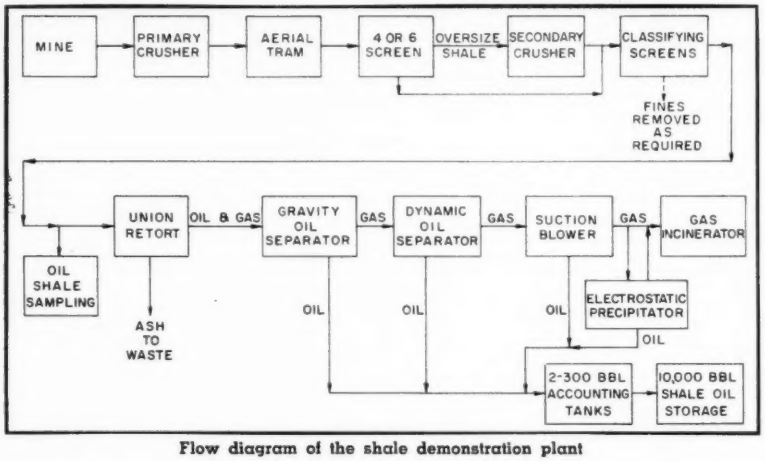
Equipment used to date includes: a Northwest 80-D shovel, with a 2½-yd bucket; a dozer equipped D-6 and D-8 cats; a LeRoi-Cleveland four-in. wagon drill, a Winter-Weiss cat-mounted four-in. drill, and a Winter-Weiss 5⅝-in. rotary drill.

Crushing and Conveying

To move and prepare the mined oil shale for retorting, we have installed crushers, classifying screens, and conveyers. These units are of commercial size because we wish to find commercial answers to the economic question stated at the outset.

The primary crusher, a 42-in. gyratory type manufactured by Allis-Chalmers, will crush 36- to 40-in. shale to about six-in. minus. An aerial tram will move the crushed shale to the valley floor, about 1000 ft below. The tram is a two-bucket, jig-back type, made by Heron Engineering Co. of Denver. It has a capacity of 125 tph.

The tram can empty onto either a shale stockpile or directly to the conveyer system leading to the secondary crusher. The latter is a 12-in. gyratory, made by Traylor Engineering and Manufacturing Co., which can size to as small as 3½-in. minus. Following the secondary crusher, as shown on the flow sheet, the crushed oil shale is fed to a series of Tyler classifying screens that will enable us to vary the consist in order to study further the effects of particle size on retorting. From the screening tower the oil shale is fed to a final stockpile ahead of the retort. Continuous sampling and weighing equipment will enable us to assay continuously the oil shale and to obtain material balances on the retort operation.



Flow diagram of the shale demonstration plant

The entire system is capable of handling more than 1000 tons of crushed oil shale per shift. It can handle rock as large as 40 in. in two dimensions in the primary crusher and reduce it to a classified stream of 3½-in. minus material by the time it reaches the retort.

Under-Feed, Counter-Current Retort

The retort being constructed for the Colorado plant is based on a design that Union Oil Co. has successfully operated at the pilot-plant level of about 30 tons per day. Technically, this retort is known as an under-feed, counter-current type. Its unusual feature is that the shale is fed from the bottom, with a large ram-like piston serving as a rock pump. As the shale is pumped slowly upward, it is contacted by hot gases, pulled downward by blowers. These hot gases, resulting from the burning of the residual carbon in the spent oil shale, convert the organic matter into raw shale oil and combustible gas that are withdrawn from the bottom of the unit. The spent shale ash continues upward and it is removed from the top. A particular advantage of this retort is that the raw shale oil condenses on the cool incoming shale, thus eliminating the need for cooling water for the retorting process.

The retort being built for the demonstration plant will have a feeding piston of 5½ ft in diameter and will stand some 50 ft high. Its capacity will be in excess of 300 tons per day. In commercial practice, we expect that nests of these retorts would operate as a unit with each nest having common oil and gas collection equipment. Each nest probably would have capacity in excess of 1000 tons per day.

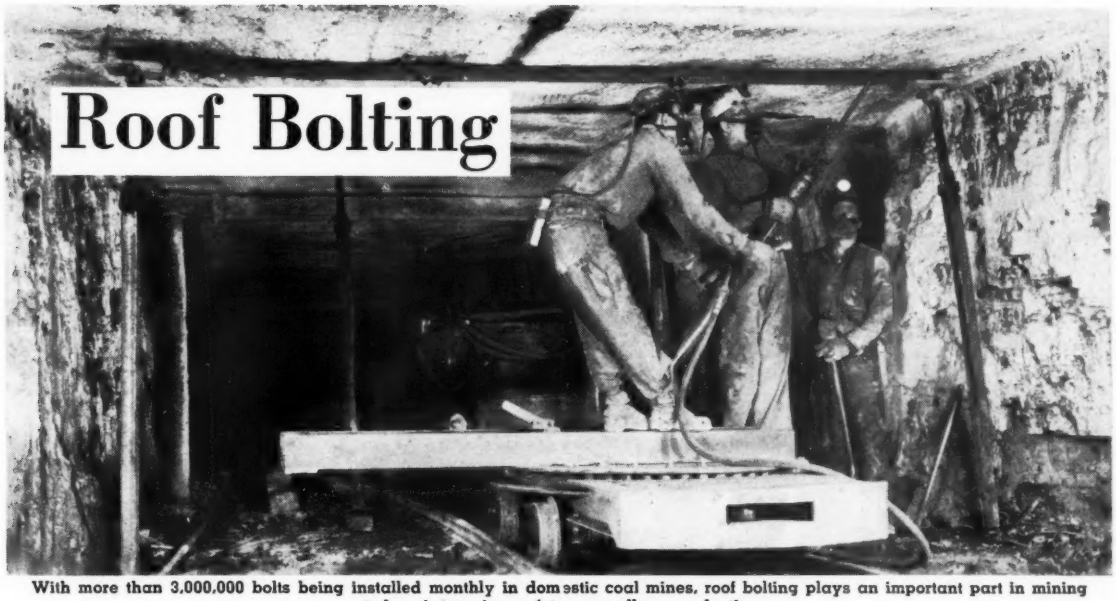
In addition to the retort, the plant includes an oil and gas recovery system, oil-storage tanks, a control house, and a conveyer for carrying away the spent shale. Buildings are provided for offices, laboratory, shops, and storage.

In concluding, we wish to point out that our finished shale retorting plant will be a hybrid, part commercial and part research. In much of it, as we have described, we are duplicating exact conditions under which a commercial plant would operate. Other parts of it, on the other hand, will consist of research tools needed only to measure, or to achieve the desired operating conditions of one unit of a large-scale commercial plant. If our designs are successful, the year 1957 should provide us with the answers to our retorting questions.

And one last point—the raw shale oil we make from this mountain is not comparable in quality to petroleum. Only after the application of beneficiation steps can it be considered a marketable raw material. Our total program is directed to develop technology so that shale oil can be competitive with petroleum.

"A penny for your thoughts"

Roof Bolting



With more than 3,000,000 bolts being installed monthly in domestic coal mines, roof bolting plays an important part in mining today, increasing safety as well as production

Safety is stressed in this critique by two experts on roof bolting. One observes that if further reductions are to be made in roof fall injuries, the place to begin is in the "danger zone" within 25 ft of the face where about 75 percent of the accidents occur. The other writer notes the advantages of roof bolting over conventional timbering at a mine in Indiana, and points out that roof bolting has not only resulted in reducing accidents and operating costs but has spelled the difference between continued operation and failure for this coal mine

Advantages of Roof Bolting at the Green Valley Mine

By WILLIAM J. McCULLOUGH
Safety Director, Snow Hill Coal Corp.

THE Green Valley Mine of the Snow Hill Coal Corp. is located five miles northwest of Terre Haute, Ind. At the present time mining is being done in the Indiana No. 3 seam which is 72 in. in thickness and approximately 600 ft below the surface. The mine is classified gassy by the Indiana Bureau of Mines and produces over 1,000,000 cu ft of methane every 24 hr.

The room and pillar method of mining is used but pillars are not extracted. The bottom has a tendency to heave, and although we have six ft of coal, the bottom has to be brushed on the motor road entries. The roof is very fragile, consisting of a gray shale with numerous slips and partings that cause it to fall very easily.

A total of 310 employes are on the payroll and production is about 4600 tons per day. There are five units on the day shift and five units on the second shift.

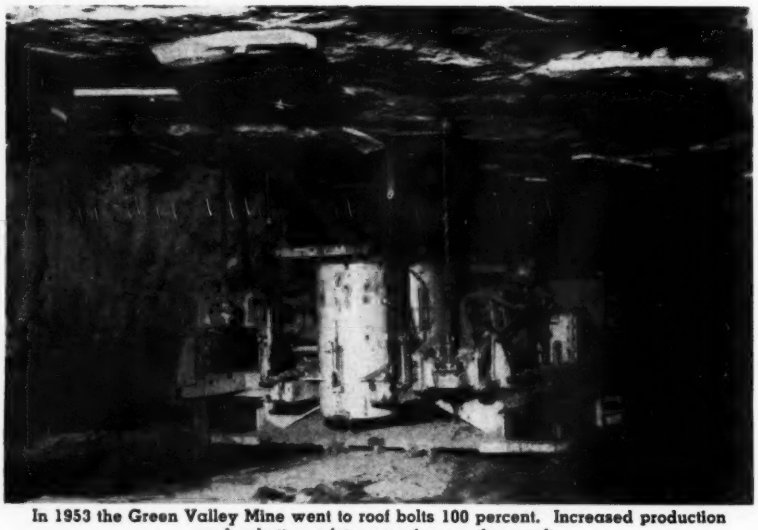
Coal is cut by Joy universal cutters, drilled with double-arm drills, broken down with compressed air, loaded by Joy loaders into shuttle cars and dumped into five-ton mine cars.

Roof bolting on each production unit is done by two men, working as a team. Roof bolting equipment consists of three Joy double-arm drills mounted on rubber, one Joy single-arm drill mounted on a crawler-type truck, one Joy single-arm drill mounted on rubber, and one homemade drill with two Chicago Pneumatic drill arms mounted on a crawler-type truck. The drills are equipped with M. S. A. dust collectors which have proved to be very successful in controlling the dust, when they can be kept operating.

Roof bolts ⅝ in. by 4 ft long with expansion shells are used. Header boards 1 by 6 by 20 in. are used in rooms and panel entries; 6 lb channels 6 in. by 10 ft long with three holes are used in main entries. A total of 353,911 roof bolts were installed during the year of 1955.

Roof Fall Accidents Reduced

The following is a summary of roof-fall accidents only. We have had accidents charged to other causes. In 1950 we had a total of 13 compensable



In 1953 the Green Valley Mine went to roof bolts 100 percent. Increased production and a better safety record were the result

roof-fall accidents for a total of 32,389 tons per accident. In 1951 there were 19 roof-fall accidents for a total of 27,936 tons per compensable accident. In 1952 we had 16 compensable roof-fall accidents for a total of 33,946 tons per accident.

The company went to roof bolts 100 percent in 1953. In that year there were two compensable roof-fall accidents for a total of 409,416 tons per accident. In 1954 we had one compensable roof-fall accident for a total of 867,705 tons per accident. In 1955 we mined 850,000 tons before the first roof-fall accident occurred, then we had two. The first happened when the victim stepped beyond the last row of bolts; he received a fracture of the pelvis and thigh. The second received a compound fracture of the middle finger when a small piece of slate fell between the bolts and hit his hand which was lying on top of a coal drill. The result was a total of 556,648 tons per compensable roof-fall accident.

Costs Reduced—Production Increased

Let's compare the costs for two years before we started roof bolting with the costs for two years when we worked under roof bolts 100 percent. The years 1951 and 1952 have been compared with the years 1954 and 1955.

1951-1952 TIMBER COST

Labor	.2790 per ton
Supplies	.2912 per ton
Compensation	.1102 per ton
Total	.6804 per ton

1954-1955 BOLTING COST

Labor	.1549 per ton
Supplies	.2915 per ton
Compensation	.0676 per ton
Total	.5140 per ton

These figures show that in the years 1954-1955 when we were roof bolting, we not only made the mine safer to work in and raised production, but we also saved .1664 cents a ton on timbering for each ton of coal mined.

There are several reasons for this saving but increased production had a lot to do with it. Whenever you keep employes on the job instead of in the hospital, production will suffer less. In the years 1951-1952 the company produced an average of 2687 tons of coal per day with an average of 296 men on the payroll, while in 1954-1955 it averaged 4354 tons per day with an average of 289 men on the payroll. In other words, 1667 more tons per day were mined with seven less men on the payroll.

Bolt Recovery

Roof bolt recovery is done with hand wrenches consisting of a long handle wrench for breaking the bolt loose and a speeder type wrench to finish the removal. Two men work as a team on this system. During normal conditions, they use a set of timber consisting of ten props. These men are experienced in this type of work and are instructed to use the utmost precaution in performing their job.

Two men will recover an average of 170 bolts per shift. They reassemble the bolts by putting on new Palnut and expansion shell, oil the threads, and stack the bolts and header boards where the roof bolt crews can pick them up for re-use. No close tabulation has been kept on how many times a bolt can be used, but reports indicate that some have been used five times. Other bolts may have been used more than that. Recovery runs about 45 percent.

Conclusion

In conclusion, it should be made clear that roof bolting has not only been an advantage in reducing accidents and operating costs but has been the difference between operating and failure for this coal mine. The company did not go to roof bolting overnight. The men had to be convinced of its value and it was an expensive changeover. However, to change back now to conventional timbering would be a much tougher undertaking. Convincing the men was an educational maneuver in which we asked the help of the United States Bureau of Mines. They conducted a course in accident prevention for coal miners and supervisors which was very well received.

Our roof is probably not any worse than roofs in Illinois, Kentucky, West Virginia, or Pennsylvania, but when it falls on someone, it is just as destructive. We are using the best method we know to keep the roof where it belongs, that is by roof bolting.

Roof bolting on each production unit is done by two men working as a team

Bolting For Safety

By EDWARD THOMAS
Mining Engineer (Roof Control)
Bureau of Mines, U. S. Department of Interior

SAFETY has been the principal consideration of the inspection and other accident-prevention agencies that have endorsed and promoted roof bolting during the past several years. Although safety may not have been the predominant reason for switching from conventional timbering to roof bolting, it undoubtedly was an important consideration. While roof bolting has played its part in the downward trend of roof-fall injury-frequency rates, its influence on the over-all roof-fall injury picture in 1955 was disappointing when one considers that the use of bolts in coal mines increased by ⅓ during the year.

Frequency Rate Increased

Notwithstanding all the attention that roof bolting has received in recent years, the frequency rate of roof-fall injuries at bolted mines increased slightly. In fact, there were as many fatalities (five) from failures of bolted roof in 1955 as the total for 1948-54, inclusive, or since bolting has been widely accepted in the coal-mining industry. The reason is that many mines are now bolting where the method is marginal in the sense that perfect anchorage cannot be obtained with the conventional bolt, yet the roof-fall accident rates in each of these mines show an improvement over that when conventional timbering was used. This means that our job is not complete if we are to obtain the maximum benefit from the method—we must improve the efficiency of such installations, and we must develop economically feasible warning devices. Some progress has been made in this direction but we are still far short of the point where such improvement and such devices are universally applicable with predictable results.

Danger Zone

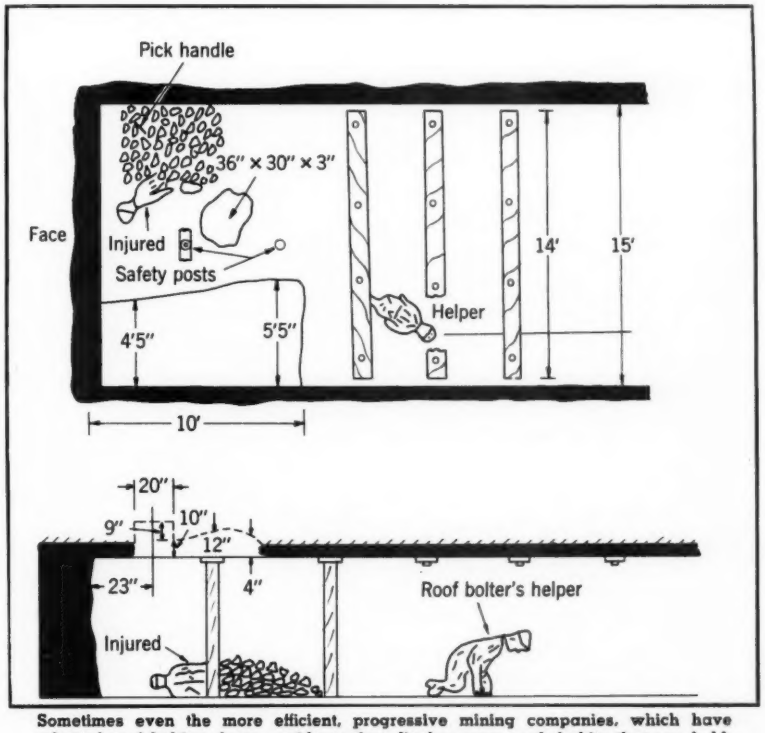
Fourteen fatal accidents were reported in areas where roof bolting was the accepted method of roof support, and all were within the 25-ft face zone where approximately ¾ of all roof-fall injuries occur. In 9 of the 14 fatalities attributed to roof-bolted areas, the rock that fell was in the unsupported space between the last row of bolts and the face being mined.

To some extent roof bolting lessens the exposure from unsupported roof in this "danger zone"—first, by reducing the operations that must be performed under temporarily supported roof; second, by reducing the average span between the permanent supports; and, third, because the bolting stiffens the rock span between the last row of bolts and the face. However, no responsible mining official would suggest that safety props or jacks be eliminated in this area as long as there is a remote chance that anyone will enter it to perform his work. Yet many are killed by roof falls under such circumstances. Moreover, even "safety support" is often inadequate. In many instances safety supports are installed in convenient spots rather than for maximum effectiveness.

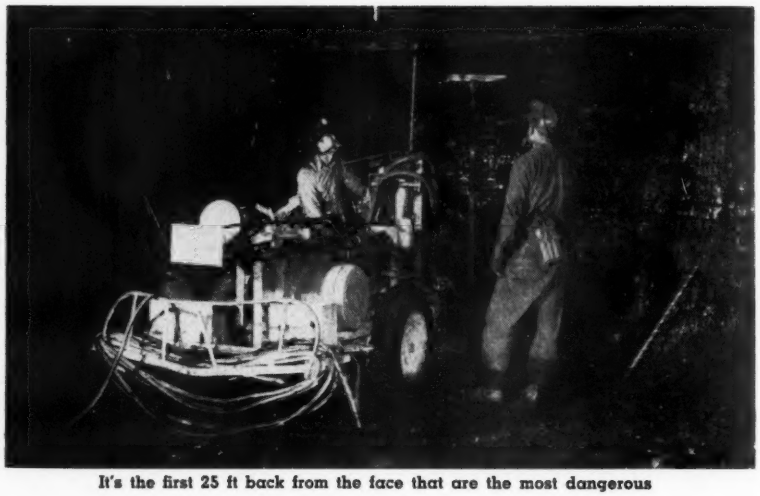
Needless Exposure

Sometimes even the more efficient, progressive mining companies, which have adopted roof bolting, have accidents that display poor work habits that are hold-overs from conventional-timbering days. To illustrate, examine the accompanying sketch of a mobile loading section where a roof-fall accident occurred in a bituminous-coal mine. Here it is the practice in room work to set bolted cross pieces on four-ft centers and not more than three ft from the face before cutting. The mining machine has a cutter bar nine ft long. Thus the maximum unsupported span, after shooting and loading a cut, is 12 ft from the last row of bolts to the face. The mobile loader has loaded out the cut, but during loading two small falls of roof occurred, which remained on the floor. The bolter and his helper entered the place with a hydraulically operated rotary drilling machine equipped with a lift for holding the crossbar in place while drilling. The bolter, leaving the machine and his helper under supported roof, entered the partly supported face area to test the roof. He pounded it with a pick and dislodged a rock slab that fell on him. The place was supported according to a standardized plan, and all laws and company rules thus were being observed, yet the man was injured. Throughout the section even the bolted roof sounds drummy, but it is secure when properly bolted. The man was aware of this, yet he needlessly exposed himself in making roof tests in the belief that he was complying with the mine's rules and regulations.

The company purchased this particular bolting machine so operators



Sometimes even the more efficient, progressive mining companies, which have adopted roof bolting, have accidents that display poor work habits that are hold-overs from conventional timbering days. See the text for an explanation of how one man was injured because of a bad habit



It's the first 25 ft back from the face that are the most dangerous

need not expose themselves to unsupported roof while drilling, but officials did not follow up to see that full advantage was taken of the safety features of the machine.

This accident suggests the following observations:

(1) If further reductions are to be made on roof-fall injuries, the place to begin is in the danger zone within 25 ft of the face, where about 75 percent of this type of accident occurs.

(2) The way to attack the problem in the danger zone is to keep the permanent supports as close to the face as possible and to eliminate exposure caused by unnecessary roof testing and other activities.

Work Under Permanent Roof Supports

The statement that exposure of men in the danger zone (the bridged area between the permanent support and the face) should be eliminated may seem impracticable, but it is being approached in several mines. It is well known that efficient mechanical loading is obtained by preparing the cut by good blasting practices or other dislodgment methods so that the loading machine can load with a minimum of digging. If the cut of coal is properly prepared, there is no need for the helper to go to the face during normal loading. The loading-machine operator and helper should work under permanent roof supports. Incidental rib coal is collected on the following cut.

Portable rotary and percussion roof-bolt machines are now being produced that have built-in safety features. These machines have booms or telescoping jacks to bear against the roof and serve as safety supports. With the use of these machines there is no reason for a bolting crew to work beneath unsupported roof. Certainly, there is no justification for a roof-bolting crew or even a foreman pounding on unsupported roof with a pick or bar, particularly when the roof is known to be bad. After a man tests the roof he has three choices: let it alone, take it down, or support it. When standardized support (either timbering or roof bolting) is used and he must support it regardless of tests, his decision must be to take some roof down and then install supports or support the roof "as is."

Under normal conditions, the only excuse for anyone to go into the danger zone in a properly bolted or timbered mine is to test for gas. If some method of remotely testing for gas could be developed, this exposure hazard also could be eliminated.

When abnormal conditions occur which require work to be performed in the danger zone, safety posts or jacks should be liberally employed, and if a post or jack must be removed for maneuvering equipment, another post or jack should replace it. If workmen and foremen could be prevented from entering the danger zone under normal conditions and many of the safety posts and jacks now used could be eliminated, then their use would be required only under abnormal conditions The Bureau recognized, of course, that present rules and regulations require safety posts, but if the suggestive objective could be obtained and exposure in this "no man's land" eliminated, such rules and regulations could be revised accordingly, with benefit to the industry both in safety and efficiency.

Uranium Milling

(*Continued from page* 59)

provided for the dryers and the packaging areas. Within the security area a complete change-house, laundry, and lunch room are provided for the yellow-cake workmen.

Tailing Disposal

Slime tailings from RIP treatment in the acid mill are returned to the grinding-leaching-classification building, automatically sampled, and used in each section of the mill for dilution of the respective classifier sand-tailing. The combined tailing from each section of the acid mill is then pumped 3200 ft by 6 by 8-in. pumps through parallel but alternate eight-in. neoprene-lined pipelines to the secondary pumps.

Likewise, and after automatic sampling, the tailings from the Burt and Oliver sections of the carbonate mill are separately pumped 2600 ft by 4 by 6-in. pumps through parallel but alternate four-in. steel pipelines to the secondary pumps.

At the secondary pumps the tailings from both mills join in a common sump. The mixed tailings are then pumped 2500 ft by 8 by 10-in. pumps through parallel but alternate 12-in. wood-stave pipelines to a disposal basin. These lines will require extension as the minus 14-mesh sands build at points of disposal. Mixing of the two types of tailing brings the pulp to a pH of 7.0 before disposal by acid-alkaline neutralization.

General

A nominal 75-ton contact sulphuric acid plant at the millsite manufactures acid for the process from Texas brimstone. From storage tanks, 93-96 percent H_2SO_4 is distributed by pumps to all daily storage tanks in the acid mill and in the pilot mill.

Water for all uses at the plant site is obtained from wells on the property. An elevated tank of 100,000 gal capacity maintains service pressure.

A large part of the power for operation is purchased from R.E.A. distribution in the Rio Grande area. Part of the power is steam generated at the plant site and boilers in the same power plant supply process steam to the mills.

Housing and Other Facilities

A community of 90 houses has been built adjacent to the plant site for staff employes. These are all two- and three-bedroom modern dwellings equipped with gas range, water softener, water heater, gas furnace, and automatic washer.

Recreational facilities include: a recreation hall for floor games, roller skating, socials, and dancing; four bowling alleys; an indoor swimming pool; and tennis courts. The company operated and well equipped Bluewater Clinic is in this area and is staffed with a doctor, technicians, and trained nurses.

In Grants the company has erected 128 modern houses for employes. Similar recreational facilities, including a roping arena, are provided.

The American Mining Congress Membership Meeting at the Hotel Plaza drew well over 200 industry leaders.

New York Annual Business Meeting

Felix Wormser, Assistant Secretary of the Interior, lauds the industry for its sound policies and asks for realistic consideration of the administration's forthcoming mineral policy.

THE business affairs of the American Mining Congress were transacted with dispatch at the Annual Membership Meeting in New York on December 3 where, in a spirit of good fellowship, representatives of the coal and metal mining, industrial minerals, and mining equipment industries got together for the organization's 58th anniversary.

AMC President Howard I. Young presided over the dinner program as well as the directors' meeting which followed. Before introducing subsequent speakers he thanked all members for their support and those serving on the various committees for their diligent efforts on behalf of the mining industry.

Julian Conover, executive vice-president, reported briefly on the work of the American Mining Congress and introduced the officers and committee chairmen who have been so active in this work. He gave due recognition to the Washington staff and described various phases of the work—the Bulletin Service, which keeps the members posted on current developments; the MINING CONGRESS JOURNAL; the Technical Committees, in which the best brains of both operators and manufacturers are joined for the industry's advancement; the Conventions and Expositions, in both coal and "hard rock" mining; the hard hitting Declarations of Policy, which are the organization's "Bible" and road map combined, and so forth.

Legislative programs that will be put forward in the next Congress were outlined, and it was pointed out that a strenuous year lies ahead. Referring to the specific recommendations for a long range minerals and fuels policy being formulated in the Department of Interior, Conover told the Government officials concerned, many of whom were present, that the industry is deeply interested in the program and most appreciative of their efforts.

He discussed the highlights of recent and expected developments in tax matters—including the proposed new regulations covering the natural resource provisions of the 1954 Internal Revenue Code—and in labor legislation, and reviewed the progress of a drive for Federal inspection of metal and nonmetallic mines and quarries (see page 52). He touched on recent and prospective Government action in the fields of public lands, foreign trade, highway construction, stockpiling, restrictions on mergers and corporate acquisitions, renegotiation, silver legislation, coal research, uranium and atomic energy, social security and many other matters of importance to the mining industry—with the general observation that "Sometimes we have to run like the devil to stand still—and then sometimes we make real progress."

The Treasurer's report, presented by "Drew" Fletcher, chairman of the Finance Committee, showed the American Mining Congress to be operating with a balanced budget and a satisfactory cash reserve.

Felix Wormser, Assistant Secretary of the Interior, made a few remarks on the seriousness of the present world situation and the policies of the Federal Government. He said that the drafting of a new long-range minerals policy by officials of the Interior Department is a big job and one which they are determined to do well. The mining industry was asked to give these recommendations its considered attention and support.

Henry Fernald, chairman of the AMC Tax Committee for the past 26 years, made a short, forceful talk on the general tax situation, discussing the proposed natural resources regulations and also pointing out the need for further improvements in our tax laws. Ellsworth Alvord, AMC Tax

(*Continued on page* 92)

Why the Yieldable Arch gives better roof support

When you drive a drift through heavy ground formations you usually need some kind of roof support, at least until the surrounding strata have had a chance to relax and form a natural pressure arch. Several types of material—timber, steel, concrete—are used as roof supports.

However, no rigid material can long support the dynamic forces caused by rock pressures and the weight and subsidence of the overburden. As a matter of fact, the more rigid the support the more aggravated the condition may become. This, in turn, is reflected in much higher maintenance costs.

This brings us to Bethlehem's Yieldable Arch, which "gives" rather than deforms under excessive pressures. This gradual yielding allows the ground to relax into a natural pressure arch, restoring equilibrium of the disturbed forces.

A Yieldable Arch set consists of curved U-shaped sections nested together at points of overlap. These overlapping joints are secured by heavy U-bolt clamps which are drawn up tight enough to hold fast under a predetermined load. When forces exceed this load, friction in the joint is overcome and the arch set yields before deformation of the steel takes place.

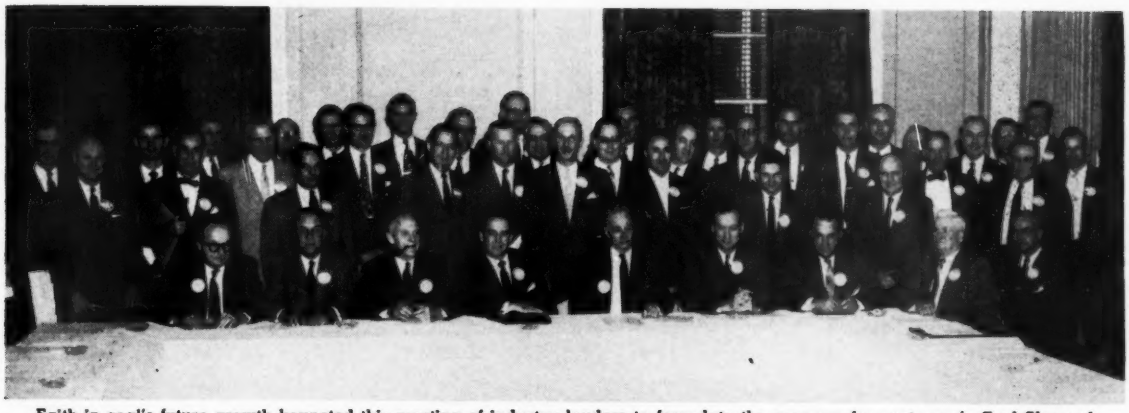
Besides increasing mine safety, the Yieldable Arch offers recoverability and usually pays for itself in its first year of service. Some installations have paid their way in less than six months! A Bethlehem engineer would like to discuss the advantages of the Yieldable Arch with you; you can reach him through the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



Faith in coal's future growth keynoted this meeting of industry leaders to formulate the program for next year's Coal Show of the American Mining Congress

Program Committee Meets

To Outline Technical Sessions for 1957 AMC Coal Show

THE primary object of the Program Committee for the 1957 Coal Show at its meeting in Pittsburgh, November 15, was the selection of topics and speakers for next year's largest industry affair, to be held in Cleveland next May 13-16.

Reflecting confidence in the future growth of the industry, the committee drew up a program designed to detail the latest advancements in coal mining technology and safety. In sessions covering continuous mining the emphasis will be on maintenance and face transportation. A-c power and a discussion of modern haulage systems will be featured at conventional mining sessions. Coal preparation people will concentrate on water clarification, while overburden handling and maintenance methods will be stressed at the sessions on strip mining. The management and safety session will feature papers on safety through education and training, and industrial engineering. A general outline of the technical program appears below.

Next year's Convention will also, of course, include the biennial exposition of mining equipment. All indications are that more companies will display more products for use in our Nation's coal mines than ever before. Convention-goers, in addition to hearing in convention session about the work that new pieces of equipment are doing, will also be able to go onto the exhibition floor and see that equipment demonstrated.

Plans are being made to assure a full schedule of entertainment, for both the mining men and their ladies. There will be the annual Coal Miners Party—a gala affair that in the past has been a convention highlight. Then too, there will be the customary round of individual parties and impromptu get-togethers.

Only once in every two years does this great opportunity come to the coal industry—the opportunity to hear industry experts describe the latest in coal mining technology, and to see such a wide panorama of the newest in coal mining equipment and supplies. It is not too early to make arrangements to attend the Coal Show in Cleveland next May. Applications for hotel accommodations have been sent to the industry, but if you have not yet received yours write directly to Louise D. Perkins, Director, Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13, Ohio. This is one meeting you can't afford to miss.

Outline of Sessions

MONDAY MORNING
Continuous Mining

MONDAY AFTERNOON
Open

TUESDAY MORNING
Conventional Mining
Coal Preparation

TUESDAY AFTERNOON
Strip Mining

WEDNESDAY MORNING
Conventional Mining
Strip Mining

WEDNESDAY AFTERNOON
Management
Safety

THURSDAY MORNING
Continuous Mining
Coal Preparation

THURSDAY AFTERNOON
Open

Power hydraulic controls provide fast, positive response . . . make the operator's job so easy that he's not subject to end-of-the-shift letdown. He's actually enthusiastic about pushing the machine to its high limit all shift long. "It sure is easy to operate . . . has all the power it needs," says the operator of this contour-stripping 1½-yard K-370 owned by B. G. & M. Coal Co., Manchester, Ky.

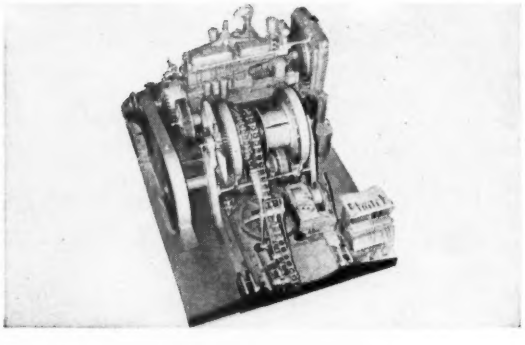
Gaining a BIG power bonus

Link-Belt Speeder shovel-cranes now deliver more usable horsepower than other machines with the same engine

Why? Because a Link-Belt Speeder is engineered for extra-structural strength to take full advantage of the engine's available horsepower and still remain well within engine manufacturers' recommended speeds. For example, Model X when run at 750 rpm develops *125 hp* . . . at 950 rpm it develops *150 hp!*

Thus, with a Link-Belt Speeder on your job you've got more usable power—extra power to sock the dipper into the bank, come up with a full load. And you've more power, to hoist, swing and travel.

And bonus horsepower is but one of many reasons why Link-Belt Speeder owners have been able to completely revise and upgrade their standards of shovel-crane performance. Why not see your Link-Belt Speeder distributor for the complete story or write Link-Belt Speeder Corporation, Cedar Rapids, Iowa.



Size and strength of components

In a Link-Belt Speeder you'll find big, extra-strength shafts, clutches, gears and other components . . . units easily able to handle the extra power the machine's engine develops. Result—more production and yet lower cost of maintenance and service . . . less downtime, more work time. 14.327

It's time to compare . . . with

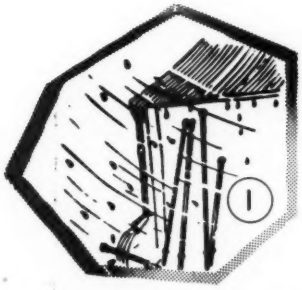
LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls

Leading Causes of Drill Steel Failure*

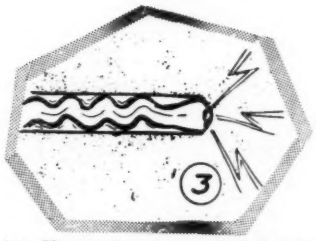
Want to extend the life of your drill steels? Then avoid the techniques given below

ALTHOUGH there are scores of ways to ruin good drill steels, a manufacturer of rock drills and other pneumatic equipment for mining, quarrying and construction work has picked out nine that do the job fastest and "best." Reported by its representatives in the U. S., Canada and 85 other countries around the world, these methods are the leading causes of premature drill steel failure:



(1) Storing steels in the open. Rain, snow and normal dampness will rust both the exterior and center hole of a steel, leaving a rough surface particularly susceptible to metal fatigue.

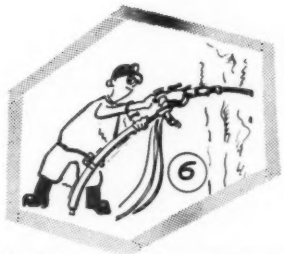
(2) Handling steels roughly during transportation. Deep scratches on the outer surface quickly become major structural weaknesses. (For identification purposes, stamp a number into a steel. This makes it easy to find and insures extra speedy breakage.)



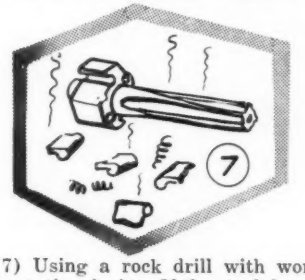
(3) Forgetting to regrind the steel. That tough tungsten carbide insert will lose its original cutting potential and then the rock drill will damage the rod instead of the rock. You'll crush the insert.

(4) Ignoring instructions for grinding steels. Grind the bit just as sharply as you can. Then, while it's still hot, dip it into a bucket of cold water. This is always good for a laugh —and early breakage.

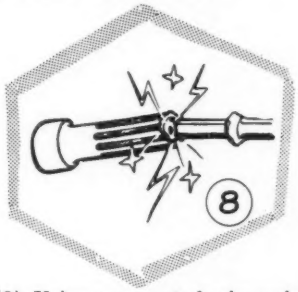
(5) Running your drill with too little pressure on the steel. This will make the drill jump on the steel's collar and keep the piston from hitting the steel. It develops particularly high stresses on the rod.



(6) Using the pusher with too much force. This helps bend the drill steel, making it break early in the game.



(7) Using a rock drill with worn-out rotation device. If the steel doesn't rotate with each blow, it will suffer heavy stresses on both the rod and bit. This means early breakage.



(8) Using worn-out chucks and pistons in the drill. This is probably the best way to ruin the shank of your drill steel. That's because the shank will have a tilted position in the rock drill and the piston will hit only one side of its surface. After running your drills a while, the steel's shank will look like a rivet head.

(9) Using your steels for scaling. For outright ruin of a good drill steel in the shortest possible time, you just can't beat this method.

*Information and pictures were furnished by Atlas Copco Eastern, Inc., Paterson, N. J.

Increasing U. S. Coal Production Through Foreign Export

The United States Merchant Marine must be materially strengthened if the export markets for American coal are to be developed to their full potential. Excerpts from an address delivered at the recent AMC Coal Division Conference tell why

By RICHARD L. BOWDITCH
Chairman of the Board
C. H. Sprague & Son Co.

THE medical profession tells us that good circulation is essential to sound health, and transportation should certainly be recognized as the circulatory system of our national economy. Our public transportation business has developed vigorously and now represents about 1/6 of our total net corporate investments—plus billions of dollars in Government funds. Every year it performs services valued at 1/10 of all the goods and services we produce. It absorbs ten percent of all expenditures for new plant and equipment and employs five percent of the country's labor force.

Total it all up, and transportation is a mighty big business. It is essential to the personal life of every American, helping to give our people the world's highest standard of living.

Our international transport is the shafting which transmits the power of our industrial machine to the far-flung corners of the globe. A healthy transportation system is vital to our economy and security. We cannot afford hardening of our transportation arteries. Between wars, American shipping is expected to be seen and not heard. Our merchant fleet has been the stepchild of government for many years and is still on a hand-me-down basis. Actually, it is not as shipshape as might appear.

Merchant Fleet Today

During World War II, the United States completed the greatest shipbuilding program which the world has ever seen. More than 5000 merchant type vessels were constructed for prosecution of the war. Of these, some 4800 remained. Under a ship sales program, nearly 2000 were sold. The rest are either in the national defense reserve fleet or in temporary use. This huge building program having been completed, there next came a great relaxation in United States during which the art of shipbuilding was almost lost.

The result is that roughly 80 percent of the United States Merchant Fleet is beyond the half-way period of normal economic life and there is no apparent program for replacement, expansion, or modernization. Moreover, this "Modern Merchant Fleet" of ours is carrying only a little over 20 percent of the American export dry-cargo trade. United States vessels can expect keener competition from a larger and more modern fleet of foreign ships. We must readjust our sights in light of our newly awakened interest in trade among the nations as a substitute for aid.

From the earliest days of American shipping, there was a recognition that Government encouragement was necessary if ships of our flag were to play an important part in the overseas trades. It has always been the policy of maritime nations to sustain their merchant marines by encouragement and financial aid, in order to maintain a strong position in the international trades. We can rely upon only American ships for continuous, dependable overseas delivery. In times of war or during crises of international conflict, we have seen the merchant marines of other countries desert our ports, either to assist their own countries or to earn more lucrative profits elsewhere. Lacking an adequate merchant marine of our own, we have seen our ports piled high with cargoes waiting export—at great loss to American businessmen.

The value of American shipping is not confined to the coastal areas. Some time ago, the Shipbuilders Council of America made a study of the sources of materials which went into an ocean-going vessel. It revealed that in a large vessel, every state in the Union made a commodity contribution. When a vessel has put to sea, its value in the transportation of American exports and imports is also subject to wide geographical distribution. Cotton from southern states, wheat from the great plains and western states, barley, dried and canned fruits from California, manufactured products from every section of the United States, and coal from Pennsylvania, West Virginia and Kentucky are among our big export commodities.

The foreign trade of the United States constitutes about ten percent of the value of our national production, but the last ten percent in any business is often the margin of profit or loss. A healthy American merchant marine is a vital prerequisite to this export business.

About the Author

RICHARD L. BOWDITCH is backed up by 34 years of experience with the mining industry, having started work in the West Virginia mines of the Logan County Coal Corp. in 1923. He has had varied experience, including work for Norfolk Testing Laboratories, to qualify him for the long list of corporate directorships he now holds. Because of his outstanding qualities of leadership he was picked to serve as president of the Chamber of Commerce of the United States in 1953-1954.

Maritime Policy

Our merchant marine asks Government for a consistent policy toward its needs as an element of national defense. It must be assured equitable consideration with other elements in

(*Continued on page* 79)

An attentive audience was on hand for the meeting

Coal Division Conference

Attracts Largest Attendance Ever

ON November 16 the Annual Conference of the Coal Division of the American Mining Congress was held at the Penn-Sheraton Hotel in Pittsburgh. The 22nd such conference, well over 350 representatives of coal producing companies and manufacturers of mining equipment were in attendance to hear and discuss the technical problems currently occupying an important place in the industry.

At a luncheon meeting which was filled to capacity, L. C. Campbell, vice-president of Eastern Gas & Fuel Associates and chairman of the A. M. C. Coal Division, presided. He presented the featured speaker of the day, Richard L. Bowditch, chairman of the board, C. H. Sprague and Sons, Inc., and also chairman of the board, American Coal Shipping, Inc. A résumé of Mr. Bowditch's talk appears on the facing page.

Twenty-one subcommittees of six full committees made reports on a wide variety of topics. The Rail Haulage, Conveyor and Mechanical Mining committees all reported at a morning session, while the committees on Coal Preparation, Underground Power, and Roof Support told of their work during the afternoon. As each report was presented, it was discussed from the floor and many valuable suggestions were offered for future committee action.

The only requirement for membership of the Coal Division is an interest in coal mining. All reports are planned with the original object of the division in mind—to present the facts concerning modern mining methods and equipment to the industry without recommendations or bias. These six committees meet at least twice a year, with further subcommittee meetings as necessary, to assemble and review information that is constantly being gathered by letter and personal contact. As studies are completed, they are made public to the industry through publication in MINING CONGRESS JOURNAL.

Following is an account of the reports as they were presented at the meeting:

COMMITTEE ON RAIL HAULAGE

J. J. REILLY, Chairman

THE first report of the day was given by C. S. Szekely, chairman of the subcommittee studying the various factors that influence planning and construction of underground rail haulage systems. The first step of the group was to make a statistical survey covering a large number of representative mines in various coal fields. The data submitted by Szekely showed the general physical qualities of the seam, the methods and materials used in the construction of the haulage road and in the selection of the haulage equipment. When completed, the final report will show how the methods of track construction and the selection of the rolling stock are affected by the present trend toward higher capacities, larger equipment and increasing length of main haulage lines.

* * *

There followed a report on operations of underground rail haulage prepared by a subcommittee consisting of R. D. Flowers, chairman; Stephen Krickovic, C. W. Rountree, Jr., and G. N. McLellan. Included in the report were four case histories showing what is good practice in operating underground rail haulage systems. A brief summary of these histories follows:

At Mine "A," 30 haulage men handle about 7000 tons of material daily, including rejects and mine rock. Main line haulage distances vary from 8000 to 18,000 ft. At the tipple, drop-bottom cars dump into a bin which in turn feeds onto a decline conveyor which transfers the coal to a mine entry in the seam below through which it is hauled to the outside portal. Eighty-five-lb rail is used on main line haulage and is thermit welded. Car trips, either empty or loaded, never exceed 20 cars. The dispatcher is in constant contact with loading points by telephone and uses telephone and radio telephone to keep in communication with his haulage crews. Block signals are used near the bottom because coal is hauled from different directions and the loaded tracks intersect in the vicinity of the dispatcher. The disptacher has a control panel in his office and he alone has access to

the light switch. In this way he controls the movement of loaded trips coming into the tipple area.

Mine "B" is in the seam beneath the mine described above, and produces approximately 5200 tons of material per day. Forty-two haulage men handle this amount to the outside and also take care of the production from Mine "A." Coal from Mine "A" has to be handled only 4500 ft while most of the coal produced in Mine "B" is transported 15,000 ft.

Gathering haulage crews are under the direct control of the dispatcher and wait at designated locations for job assignments by the dispatcher. Generally speaking, one gathering motor is expected to pull from 100 to 150 loads per shift. Main line trips are made up at the mouth of each coal producing butt entry where they are picked up by main line motors. Different sized main line motors are used and individual trip size is controlled by a three-percent grade on the main line. Electrically operated derail switch throws are used on the main line where steep grades are encountered.

At Mine "C" the haulage plan was laid out so that substantial tonnages could be hauled directly from individual production sections to the slope bottom in an unbroken train of large, 8-wheel mine cars. Trips consist of 15 to 20 12-ton cars with a 15-ton locomotive at each end. On the sections, a double-loop arrangement is used. Empties are pulled through the empty loop and pushed back to the loading point or coupled to the empties already there. Loads are pulled off the other side of the loading loop. All haulage movement is controlled by the dispatcher through the use of radio and telephones. Electric throw switches which can be operated by the motorman without stopping the trip are employed on all primary mainline intersections. The haulage crew consists of 18 motormen and three dispatchers per day. They handle 7500 tons of material on a triple shift basis. Motors with trips of empties are dispatched to a section where the boom operator advises that a trip of loads will be ready when the trip of empties gets there.

At Mine "D" approximately four miles of Class A track make up the main haulage system. Coal and slate are transported in 8-wheeled steel cars with a capacity of 10 tons. These cars are pulled in 34 car trips by a 28-ton motor. Haulage track consists of 80-lb rail with all joints thermit welded. Electrically operated automatic switch throws are installed at all principal turnouts and actuated by trolley pole triggers. An effort has been made to design the haulage system so that trips of cars trail through switch points wherever possible rather than against the points. Main turnouts are embedded in concrete and kept clean and oiled. In place of cross-bonds, pieces of scrap 40-lb rail are welded across the bottom of the main line track rails. This also adds lateral rigidity to the haulage road. A minimum of two cross-rails are welded between each track joint.

* * *

Evan Adams completed the report of the Committee on Rail Haulage with a report on a subcommittee study of mine haulage maintenance, safety practices, lubrication and maintenance of mine cars, and maintenance of mine locomotives. In track work as in any other branch of mining, maintenance is an important item—both from the safety point of view and from an economical point of view. Track inspection and maintenance go hand in hand with the main line motorman being perhaps the best inspector. Anyone noticing any track damage, no matter how minor, should inform the dispatcher so that it can be corrected at the earliest possible time. Repair crews should be made up of dependable and experienced men that like and take pride in their work. It is good practice to consider a part of preventative maintenance, a task that should fall to some other class of labor other than track crews.

Adams went on to point out the importance of good housekeeping practices underground as a contribution to safety. In emphasizing the importance of lighting, he advised that some companies are arranging lights for illumination along the main haulage ways in block systems in much the same manner as block signals are arranged. In this way, 130 v. lights in series can be used on a 250 dc series and, since the lights are on only as long as the trip is in the block, better lamp life can be obtained which will lead to better illumination.

Records are an important part of any mine car maintenance system. These must show the number of cars in service, number of times they are dumped in a shift, the distance and speed traveled, the number of shifts worked in 24 hours, and days of operation a week or year. Records, however, must be followed and kept up to date so that the cars can be lubricated according to suggested procedure by the car manufacturer. At the time of lubrication each car can be inspected for damage and, if necessary, pulled out of service for repairs. Car repair shops should be well equipped with necessary equipment to do a proper servicing job. Adams suggested that by setting up a supply of spare parts in the shop and charging them to a cost against mine cars a better cost control of those supplies can be maintained. As the cars are repaired the worn part can be reconditioned and placed in the stock in the shop and the cost of reconditioning the part will then be charged to the mine car from which it came. In this way it will not be necessary to maintain a high inventory of parts and a considerable amount of clerical work will also be eliminated.

Records and a good preventive maintenance system are the secret of a low cost locomotive maintenance program. Experience will dictate just what kind of an inspection program each piece of haulage equipment should have and the amount of spare supplies for this equipment that should be carried in stock. When mine locomotives are repaired on a planned maintenance program, individual units on the locomotive which do not meet minimum standards can be replaced. These can then be later repaired and returned to the warehouse inventory for reuse. This type of maintenance program will allow a mine operator to carry a considerably smaller amount of new parts in stock, thereby reducing the amount of capital tied up in inventory.

COMMITTEE ON CONVEYOR HAULAGE

H. A. JONES, Chairman

THE first Conveyor Haulage subcommittee to report, the subcommittee on Conveyor Installation, is made up of H. W. Meador, Jr., chairman; E. A. Perry, J. W. Hardy, D. H. Cotrille, C. B. Tilson and Martin Valerie.

In selecting a basic design of a belt or a chair conveyor, it was pointed out, attention must be given not only to the quantity of material to be handled in a given period of time but also to the physical properties of the material to be moved. Coals vary widely in their abrasiveness, a quality which appears to be related to hardness. In many cases this may depend more on the character of associated impurities than on the nature of the coal itself. Since belting is the most expensive single item in the conveyor installation, it is well to survey closely the kind of wear it is liable to get. When material to be handled is known to be relatively abrasive, it is advisable to specify a heavier top cover than would normally be chosen. In cases where rock is to be handled also, usually a compromise is made and the next size larger conveyor and the next heavier covered belt is specified to take care of the rock. If not too much rock is involved, it is often cheaper to size the rock to fit the conveyor rather than to buy a more expensive conveyor and belt.

Most of the physical conditions encountered in coal mining can be met successfully with belt conveyors, but certain belt characteristics must be

considered in designing the transportation systems so that these characteristics are not opposed. In considering belt speed, it is important to realize that the higher the belt speed the greater the wear on the belt due to scuffing and the impact of the load. Also to be considered is the fact that the lower the belt speed the greater the belt tension and the stronger the belt has to be. For equal capacities all gearing and shafting, as well as the belt, will take less stress at higher than low speeds.

Where it is planned to load the conveyor intermittently at more than one point, a decision must be made between layer loading and full belt loading. With belts of equal width, layer loading will call for higher belt speeds than will full belt loading; however, if several loading stations are contemplated on one belt, it is important to consider the amount of possible delay time at loading stations where the transfer of coal to the belt is held up until the coal from an inby loading station has passed.

The determination of belt conveyor lengths is an important part in the design of any conveyor system. Two important things to consider are the fact that the longer the conveyor, the higher belt tension will be used, necessitating more expense of terminal machinery and higher cost belt. On the other hand, shorter conveyors mean less expensive belts and terminals to obtain the over-all length but will involve additional labor and mean more transfer points.

Physical conditions of the coal seam will play an important part in dictating the type of installation also. The conveyor, of course, will have to be protected from roof falls. In low coal when the conveyor line goes through a sway or over a local roll it may be necessary to brush roof or to take bottom to give top clearance over the belt line. The effect of water, and particularly acid water, is well known and the importance of keeping the conveyor entry well drained cannot be overemphasized. Where soft bottom is encountered, special types of conveyor supports may be needed. This problem has been solved by the use of extensible belts which can be supported by four braces, or suspending the conveyor from the top by roof bolts, and by the use of wooden sills on the bottom.

* * *

The subcommittee on conveyor operation and maintenance presented the next report. This subcommittee is chairmaned by R. U. Jackson and has as its members J. L. Thornton, Wilmot C. Jones, Jr.; F. A. Burns, W. F. Schiffbauer, E. A. Perry, and W. D. Walker, Jr.

Safety should be the principal consideration in the operation of any conveyor system. The second consideration, of course, is economy—the primary consideration of any transportation being to move coal as safely as possible with as few delays as possible at as low a transportation cost as possible. Taking the above facts into account, the first step of the subcommittee was to report on automatic protective devices and load regulation. Assuming proper installation, the subcommittee put at the top of its list of safety requirements, slippage control. It has been conceded that slippage control in a belt conveyor is a necessity regardless of whether or not fire resistant conveyor belting is used. Since it is not always practicable to have a man at or near the conveyor drive at all times, some device to prevent the drive pulley or pulleys from continuing to operate when the belt has been stopped or hung due to slate fall or other causes is necessary. The economics of these controls in the value of stopping a belt before serious damage can be done is obvious.

Emergency stop provisions are also important. One of two methods is generally used along conveyor installations for performing this function. A two-wire low voltage can be installed within easy reach of the conveyor, which, by pinching the wires together, will cause the motor to stop. Or a single cord or cable can be installed, also within easy reach of the conveyor, to operate mechanically a stop switch. A continuous line is preferable as much more protection is offered.

Any conveyor installation which has two or more units operating in tandem, or one unit discharging on the other, needs sequence start and stop controls.

On many conveyor installations with more than two units, it is sometimes expedient and necessary to operate one of the conveyors separately. Therefore, separate control is a prerequisite and provisions should be made for this feature. In many instances, protection against roof falls is automatically provided with certain types of emergency stop control lines that have been installed over or near the center line of the conveyor system. Here the advantage of a continuous control line over the conveyor is obvious where clearance permits.

Protection against misalignment can be gained through the use of limit switches. Although these installations presently are largely used on slope and main entry belts, they are also advisable for butt or panel conveyors.

Additional control equipment can be obtained to prevent reversal of the belt or over-speeding. In systems which have steep inclines or declines, a device is needed to provide holdback protection.

A conveyor installation is designed for a tonnage at which it is calculated to operate most efficiently and economically. However, many mines do not maintain a constant production over long periods of time and the daily tonnage may vary considerably. In general, the only two factors which affect the operating costs of belt conveyors under this situation are an increase in power cost and the increase in installation cost required to meet high tonnage periods. The subcommittee has started a study to show the several factors which affect belt conveyor operation cost and how these factors should be handled in the final conveyor system design.

A conveyor installation is generally designed for a tonnage at which it is calculated to operate most efficiently. Any change from the designed tonnage is made at the sacrifice of that efficiency

Another topic to be considered in any conveyor system is the method

for handling man trips and supplies. One report on this topic has been published (Man Trips and Supply Hauling, MINING CONGRESS JOURNAL, October 1954) and the report presently under way will summarize the advantages and disadvantages of rubber tired haulage, track haulage, and belt reversing.

The greatest amount of unnecessary wear on a conveyor belt tends to be on the pulley side. Some of the causes of this wear are: slippage on the drive pulley, spillage that is ground between the belt and pulley, and wornout lagging. Slippage at the drive pulley can be corrected by increasing the tension in the belt and by improving the lagging. Eliminating the spillage by speeding the belt up or by using plows and scrapers at the front end of the return pulley will reduce the amount of material that is ground between the belt and the return pulley. Worn out lagging, of course, should be replaced.

Excessive top cover wear can be caused by dirty, stuck or misaligned return rollers, poor quality belt material, too slow or too fast delivery of material to the belt, and excessive sag between idlers. By installing a cleaning system to the conveyor belt the primary cause of stuck and dirty return rolls will be eliminated. By planning the load feed onto the belt along the same direction as the belt is running and at the same speed, longer belt cover life can be expected. Excessive sag between idlers can be cured by using more idlers or by increasing belt tension.

Breaks parallel to the belt edge and star breaks in the carcass are caused by dumping directly onto the conveyor belt or by material being caught between the belt and pulley. The use of cushioned idlers and the installation of scrapers in front of the tail pulley will eliminate the primary causes of these breaks. Transverse breaks along the edge of the belt are caused by edges folding up on the structures near the terminals, mildew, or the location of final idlers too close or too high in relation to the head pulley. These conditions can be corrected in part by installing limit switches and by allowing more lateral clearance. Mildew can be stopped by using the new mildew inhibited belts. Relocating idlers or readjusting their position so that the belt edge is one-half the trough depth, or the use of transition idlers will eliminate breaks because of mislocated idlers.

New belting should be stored in a cool, dark, dry place away from petroleum products or paint materials. Belt storage areas should not be near places where ozone is generated, and if belting is to be stored for long periods of time it should be wrapped in waterproof paper. Never store a roll on its side, and if stored for long periods it should be suspended on a level bar through the roll center.

To obtain maximum life from belting in operation, damaged areas should be repaired promptly. Cuts, tears and other ruptures open the way for fine material to enter and cut fabric reinforcement. They also let moisture penetrate the belt and cause loss of adhesion. Metal rip plates can be used for emergency repairs on serious carcass cuts and breaks. Cover damage and minor carcass cuts can be repaired with air curing rubber materials. When the condition of a belt warrants it, vulcanized repairs should be made. These can be made at the mine shop if shop facilities permit or the belting can be sent to private firms that specialize in this service.

The final report will include recommended safety practices for underground belt conveyors. They will cover such points of good housekeeping, the need for properly maintained electrical equipment, the proper use of rock dust, fire doors, water lines, and fire extinguishers. The need of good ventilation will be discussed and various ventilation systems will be described, as will practical ways for the prevention of dust at loading points and on long conveyor lines.

COMMITTEE ON MECHANICAL MINING

W. A. HESS, Chairman

A PRELIMINARY report on continuous mining system was given by F. R. Zachar, subcommittee chairman. Zachar reported that in developing a workable projection or system for continuous mining, there are several factors which must be considered before arriving at any conclusions as to the best mining system to employ in the mine or section of the mine being studied. Factors which the group considers important in any continuous mining system include ventilation, the width of the mining face, the percentage of recovery desired, the type of roof control method needed, transportation facilities and elimination of as much cable handling as possible. The subcommittee in its completed report will present actual case studies of various continuous mining systems, showing why the system was selected and how the various factors mentioned above affected the design of the system.

* * *

A report on dust control for continuous mining was presented by J. A. Younkins, subcommittee chairman.

For its study of dust control measures, the group gathered data from field observations on water spray applications covering five types of continuous mining machines totaling 46 units operating in 20 mines in eight coal seams. They found that high pressure water sprays are in general use and that, judging from the visibility factors reported in the face areas, a fair-to-good job of dust control is being done. The predominant method of ventilating the face is to take the air toward the face, over the equipment and return it behind line brattice. In one case an exhaust fan with tubing is being used on development in place of line brattice. This system takes care of an important factor in dust control since float dust not trapped by sprays is carried into the return, away from the face.

In pillaring, Zachar reported, the practice is usually to make the air return around the gob side of the pillar being mined. This is usually accomplished by using tight checks between the place being worked and the section return, and, as a result, high volumes of air passing over the equipment toward the gob are possible. On development, with line brattice, the volume of air passing the equipment at the face varied from 1500 to 8200 cfm.

It is evident from the results of this study that marked progress is being achieved in dust control at the face by improved spray applications and by better ventilation practices. Further study of these techniques will bring about additional improvement in dust control.

* * *

In summarizing the activities of the subcommittee on industrial engineering, E. B. Leisenring, Jr., subcommittee chairman, reported that 17 companies or operating divisions, which in 1955 mined a total of 60,000,000 tons of coal (deep mined), had submitted data and descriptions showing to what extent industrial engineering practices were being used by their organizations. Four companies, representing 14,700,000 tons, stated they had no industrial engineering program at present. Thirteen producers, representing a 1955 total of 45,600,000 tons of deep mined coal, reported they had industrial engineering programs in effect. Additional companies are to be contacted and their data will be included in the completed study.

Eight of the 13 companies reporting industrial engineering programs said that they had used outside consultants in establishing their programs. The remaining five developed their program from within. Seven companies reported a specific percentage when asked what percent of reduction face costs was credited to industrial engineering. The average expected cost reduction was 17 percent.

In answer to the question "What percent of reduction in face cost do you estimate has resulted?" the following answers were given:

1. No figures yet — program just being developed.
2. We have reduced face costs substantially—still have a long way to go.

3. It is difficult to say the percent of reduction in face cost that has resulted as we have been in a constant state of change in equipment.
4. Man machine charts are just being instituted.
5. Actual percentage indeterminate. However, reduction has far exceeded expectations.
6. At least 20 per cent.
7. Thirty percent.
8. The face costs have been reduced by over 20 percent. This is actual reduction. No correction was made for increased labor or supply costs. The amount that can be attributed directly to industrial engineering is difficult to say. Probably less than half the reduction so far has been directly influenced by industrial engineering.
9. Direct results are estimated to be about 15 percent.
10. Considerable face cost reduction, but no percentage estimate made.
11. To date exceeded 25 percent.
12. No estimate has been made.
13. About what was expected.

The average industrial engineering program has been in operation five years. It was apparent that the application of industrial engineering was equally effective when applied to conventional or continuous mining systems. Five companies of the 13 use no incentives. Of the other eight, four are paying incentives to salaried supervisors, one is paying incentives to supervisors and workers, and three intend to install incentives in the near future. The four companies who paid incentives to supervisors only, felt that this was important to the success of the industrial engineering program at their properties, while companies that paid incentives to workers and supervisors reported that this was the "key to the program."

COMMITTEE ON COAL PREPARATION

R. L. LLEWELLYN, Chairman

JACK M. BISHOP, chairman of the subcommittee on maintenance and mechanical drying equipment, reported on work of his group. Data has been collected in an effort to show the industry ways in which it can improve mechanical drying equipment performance through the presentation of case histories from 20 operations covering several seams of coal showing what is current practice in operating mechanical drying equipment. The report has been completed and will appear in an early issue of MINING CONGRESS JOURNAL.

* * *

Maintenance in operation of thermal drying equipment was the next subcommittee report presented. This report covered information received from eight coal companies covering 11 heat-drying installations using a total of 21 drying units. Case histories were used to show just what is being done at these operations in the way of operating and maintaining thermal drying equipment.

* * *

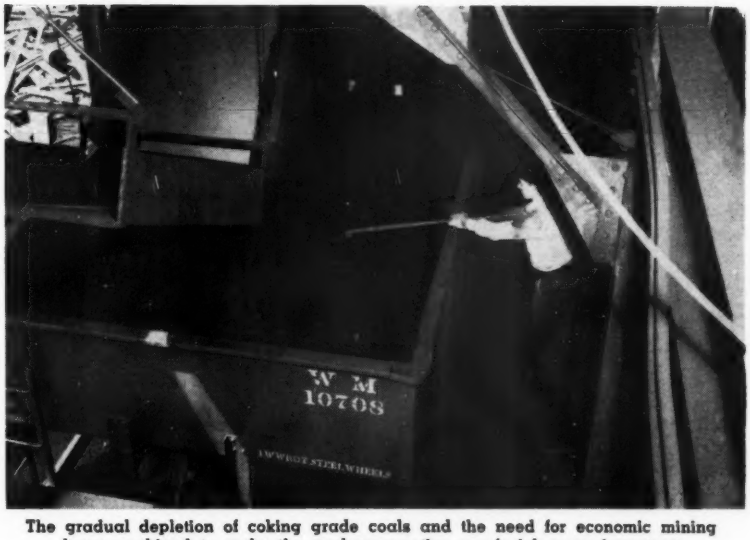
John Reilly presented the final subcommitte report for the Committee on Coal Preparation, covering the field of washery water clarification. This report was published on page 67 of the December 1956 issue of MINING CONGRESS JOURNAL.

Water clarification is not a new problem, however, a gradual depletion of the coke grade coals and the need for economic mining have been two things that have aggravated the problem. If we define clarification as the simple process of separating solids from water, keeping in mind that an increase in fine clays makes the separation more difficult, we must not consider water clarification a major preparation problem. Because of a recent study by the subcommittee on water clarification, the American Mining Congress has adopted the term "Closed Solids Circuit" instead of "Closed Water Circuit" and stresses the need for solids control so as to provide uniform cleaning results, allow maximum recovery of marketable coal, obtain maximum amount of usable water, reduce degredation in the plant, reduce pump and pipeline maintenance, allow compliance with clean streams legislation, and to reduce the cost of flocculents and establish a basis of calculating losses.

Many plants have established a plant bleed after determining the amount that they will have to waste to produce a uniform marketable coal. The average plant waste bleed seems to be about 1½ percent to 2 percent of the raw coal feed.

To allow the direct comparison of plant performance in various coal fields, certain standards have been established by the committee. With these standards established, the next step of the committee is to be in the fields of degradation and flocculation. Two task forces have been set up and have initiated studies of these important topics.

The job in the future seems to be the study of the economics of recovery of the marketable coal now being wasted, and the most economic way of disposing of the waste. Economics will govern the over-all operation at the mines and it is the job of the coal preparation man to take the raw coal feed as furnished and produce the maximum amount of usable coal at the least possible cost.



The gradual depletion of coking grade coals and the need for economic mining have combined to make the coal preparation man's job more important

COMMITTEE ON ROOF ACTION

J. ALLAN BROOKES, Chairman

A REPORT on the design of mine roof bolting systems was presented by E. H. Johnson and Lewis A. Panek.

Elimination of ridged supports from floor to roof was such a drastic step that great caution had to be employed for protection of men exposed to the hazard of roof falls. Therefore, whatever error was made in estimating requirements of a bolting system in any one mine was cheerfully made on the conservative side. Uniform patterns that are presently in use have evolved from this situation. Sometimes more bolts than are necessary are used and the bolting pattern adopted is not

always the best suited to the conditions. It is therefore important to approach the question from a scientific angle to replace the rule of thumb which has been so freely used.

Studies have been undertaken by the U. S. Bureau of Mines to indicate possible variables that can be calculated in the application of roof bolts. Laboratory experiments indicate the following factors enter in any analysis of the problem:

(a) Average bed thickness of mine roof
(b) Length of roof bolts
(c) Bolt tension and anchorage capacity
(d) Number of bolts per set across the entry or room
(e) Spacing of the sets along the entry or room
(f) Width of roof span
(g) Reinforcement factor—percent decrease in roof strata bending

The report then went into a description of a general procedure for designing a roof bolting system by the use of data gained from the above mentioned experiments.

* * *

New types of bolting equipment was the subject of the next subcommittee report, presented by V. A. Curry. The value of developing some method of reading bolt tension directly was pointed out. Tests have shown that the torque tension relationship often varies widely within a mine and that bolt tension often increases or decreases after installation. A method of quickly making torque tension tests outside the mine by using a simple jig to hold the expansion shell was also described. The report was concluded with a wording that correct hole size is important and that hole size must be accurately controlled if satisfactory bolt anchorage is to be attained.

* * *

Specifications for roof bolting materials. The procedure was outlined that is to be followed in having the specifications that have been adopted by the American Mining Congress presented to the American Standards Association for acceptance as an American Standard.

* * *

Geological Aspects of Mine Roof Action and Control was the title of the final Roof Support Committee report, submitted by G. R. Spindler. Studies now sponsored by the subcommittee on the geologic aspects of mine roof action are designed to correlate field data with respect to the rigidity and supporting strength of roof-bolt anchorages in materials of varying degrees of hardness and stability with variations in the torque applied to the bolts in their original installation. It is difficult to establish precise patterns in such tests because of the relative impossibility of obtaining exact duplication of bolt installations, even in adjacent holes in the same strata. Although tests are not completed, in results to date it has been observed that the point of first movement of roof strata is not always closely related to the maximum resistance to withdrawal of the bolt or of the maximum supporting strength. The initial stability of the installation appears to be closely related to the original torque or bolt tension applied when the bolt is installed with the resistance to first movement increasing with the supplied torque. Tests further indicate that for anchorages in hard shale or sandstone the optimum torque may be of the order of 170 ft lbs, with the increase in stability establishing a fairly flat curve for torques above that figure. For anchorages in relatively soft shales, the optimum torque may be at a somewhat lower level—about 150 to 160 ft lbs.

In general, there appears to be no real advantage in applying torques or bolt tensions in excess of the optimums indicated as these limits approach the yield point of the bolts in common use.

COMMITTEE ON UNDERGROUND POWER

JOHN DUNN, Chairman

THE last committee to make its report to the industry was the Committee on Underground Power.

A report on underground mine lighting was presented by R. S. James. James gave a brief synopsis of U. S. Bureau of Mines Schedule 29. In his discussion he covered temperature limitations, drop test, voltage limits, explosive-proof features, conductor sizes, connections for fixtures, and circuit protection as outlined in Schedule 29.

The U. S. Bureau of Mines has now approved two commercially made lighting systems as permissible for safe use in gassy or dusty coal mines. The approvals cover a two-wire and a three-wire distribution system.

* * *

R. E. Havenor and H. A. Blair described lighting fixtures that have proven satisfactory in experimental installations. Consisting of an enclosure suitable for use underground and housing two 14-watt fluorescent lamps, the lighting fixtures for these systems weigh in the neighborhood of 20 lbs. They are locked so that only authorized personnel are able to open and replace lamps or make repairs. To advance the lighting system, a miner carries one fixture and a connecting cable forward, hangs it at the face and plugs the cable connector into the next lamp for power.

* * *

Illumination and fixture spacing was discussed by S. P. Carter. A 15-ft spacing of fixtures in entries 18 ft wide gives an average light distribution of from one to two-ft candles along the left-hand rib and in the active working area of the faces, Carter said. It is believed that this is the minimum acceptable value for area mine lighting and that additional light is needed in the active working faces.

* * *

F. R. Sell discussed power supply systems for mine lighting. He pointed out that lighting systems today had been designed to perform on a 60-cycle power supply. Some consideration has been given to 400-cycle equipment, but more development work will have to be done before it will become practical for mine use. At one test installation, a motor-generator set consisting of a 25-hp d-c motor, coupled directly to a three-phase 120-240 volt, 60-cycle a-c generator supply power to 270 lamps. A second method of providing the 60-cycle a-c power from a d-c power source is by means of an electrical converter. At the present time there are no converters manufactured for this type of service.

When a source of a-c power is available in the coal mine, the power for a lighting system can be taken directly from the power supply, although transformers will be needed if higher than 120-240 volt power is carried in the mine power system.

* * *

R. S. James discussed three methods of providing ground protection that have been discussed or proposed. These were: (1) the conventional grounding system where a separate ground conductor is used for grounding all frames and the various components; (2) a system which provides so-called ground protection by using complete isolation of the power supply and the circuit so as not to give any difference of potential between ground and any of the conductors; and (3) an isolated supply system with fault-indicating relays.

* * *

R. R. Goddard discussed the number of fixtures allowable for different sizes of cable and the factors that limit this number. He pointed out that with #14 cable conductor, 20 fixtures are allowable, the limiting factor being the current capacity of the wire, which in this case is 15 amp. With #12 conductor, 27 fixtures are allowable, the limiting factor being both voltage drop and current capacity of wire, which is 20 amp. With #10 cable, 33 fixtures are allowable, the limiting factor being the current

capacity of the connectors and plugs, 25 amp.

* * *

The discussion was concluded by R. P. Dice who outlined the advantages of mine lighting. Among the points brought out by Dice were: (1) better care of trailing cables on mobile equipment; (2) ability of the operators to move equipment faster and safer; (3) there is auxiliary light for cutting and loading at the face; (4) the loading machine operator can more easily position the loading boom when loading a shuttle car; and (5) the increase in workman morale.

* * *

A-c power underground was the subject of a report by R. R. Goddard. After outlining the development of d-c power in coal mines, Goddard discussed briefly the advantages of a-c power. His subcommittee has undertaken a study of a-c installations which will cover such points as: motor characteristics; controls; effective voltage regulation; machine characteristics; safety; protective devices; power transmission and distribution; cable and accessories; maintenance, and economics. A typical a-c power distribution system will be described as will equipment and machinery for a-c mining operation.

* * *

The subcommittee on temporary cable splices reported that it was in the process of having temporary splices supplied by coal operators tested for electrical characteristics and strength. When the results of these tests are compiled, the information will be released to the industry.

* * *

Underground flood protection was the subject of a report presented by Frank R. Hugus, subcommittee chairman. Mines facing the constant threat of water flooding may be able to protect vital and expensive equipment from water damage by the use of an old tool—the diver's bell. This may be applied to protect substation or similar installations, but can also be applied to protect a small pump and associated electric equipment. To overcome the decrease in air volume caused by increasing water pressure and consequent rising of water level, it may be possible to build a protective compartment large enough to provide for such rising water level; or it may be possible to provide cylinders of compressed air or trace of chemicals which can be activated by the rising water level in the compartment to increase the gas pressure. Compressed air can also be provided from the surface.

* * *

John A. Buss reported on permissibility problems. Buss said that Schedule 2F, officially issued August 3, 1955, contains a number of points which the subcommittee would like to have clarified or changed.

The group recommended that all reference to public demonstration be deleted from Schedule 2F on the basis that later public demonstrations in no way enhanced the level of safety of the schedule. The subcommittee also registered dissatisfaction with sections of Schedule 2F having to do with: the field assembly of certified components; the certification of electrical components; the rebuilding or repairing of equipment; and experimental electrical face equipment in gassy mines. The above recommendations brought forth much floor discussion and because of so much diverse opinion the subject was referred to the subcommittee for further study.

Increasing Coal Production Through Foreign Export

(*Continued from page* 72)

our economy that are vital in both peace and war. Happily, Secretary of Commerce Sinclair Weeks and the members of the present Federal Maritime Board have revealed a keen and clear awareness of this situation and of this great opportunity. They are pressing forward with imagination and vigor toward a sound comprehensive maritime program and policy that can mean a new day's dawning in the history of our merchant marine. This must, however, be "an all-hands evolution." Unless we all pitch in now, a golden opportunity will be lost.

The merchant marine needs friends in the business community. As more American business comes to American ships they will need less Government aid, pay more taxes, and provide more employment. It is not only patriotic to use American ships—it is good business.

Unless we have a merchant fleet to carry our goods to other nations, our foreign commerce will dwindle and our interest in these countries will diminish. And if we have no such interest, we could not have the same acute feelings about their welfare and freedom —about collective security and world peace. It is not that the principles of liberty are less dear, but we shall be less interested in their application to these countries.

Export Coal

We have seen what has happened recently in the world. The blocking of the Suez Canal brought about the removal of ships of several nations from the world fleet. When we look at the coal picture, we are discouraged to find that only about one percent of the 40 million tons of this year's export coal is going in American bottoms. This is indeed tragic. Unless the trend is reversed, the coal industry will put itself in the hands of others without having a voice in the world markets which it is presently supplying.

The mines of this country have been quick to get themselves into position to produce the coal necessary for consumption by the countries of Western Europe, Japan and South America. Three railroads alone are spending nearly 250 million dollars for facilities to handle coal at tidewater.

What is the coal industry doing to insure that its traffic lanes to its ultimate export markets are kept free and clear? The answer to this is, "very little." It is time that this country woke up to the fact that the fourth arm of defense is our merchant marine. If we cannot deliver the products that are necessary for survival of friendly nations, then what is the use of producing those products?

A complete understanding for the necessity of a strong merchant marine is vital not only to the coal industry but also to other essential export commodities. That the export of coal will increase in the foreseeable future is a foregone conclusion. In order to assure the coal industry a strong position in export trade, we must carry more export coal in American vessels.

It behooves the coal industry to get behind such instruments as American Coal Shipping, Inc., a joint venture of some of the leading coal operators of the country, together with several railroads and the United Mine Workers of America, to insure the delivery of coal to overseas markets desperately in need of it. This can only be done when a reasonable share of coal is carried in American ships.

Fourth Arm of Defense

The United States has become a leader in world affairs; we cannot carry out our obligations to less fortunate countries, nor exert proper influence unless we have sufficient strength upon the seas. We cannot depend, in an emergency, upon the pooling of the ships of the maritime nations of the free world: First, because there is uncertainty as to who will be our allies and who will be our foes. Second, certain countries may be overrun by a powerful neighbor before their merchant shipping can be extricated. Third, the United States, as an important world power, must never rely on any other nation for so important a component of its national strength. We must get behind the creation of a more modern American Flag Merchant Marine—not only as good business but as our fourth arm of defense.

Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

PROSPECTS are that the first session of the 85th Congress, which convenes January 3, will be a busy one, with legislation of interest to the mining industry coming in for careful attention. Tax revision, amendment of the Taft-Hartley Act, "pre-merger" legislation, freight absorption, national mineral policies, and tariff proposals are but a few of the knotty matters that will be considered by the Congress.

Following the State of the Union address, the President is expected to send Congress a series of messages outlining details of his legislative program, both in the foreign and the domestic field. Administration aides are putting finishing touches on next year's budget, which many sources predict will exceed $70 billion. Heavy outlays for defense and foreign aid are expected to close the door to any general tax reduction despite the fact that revenues are at an all-time high.

Some changes are expected in the President's Cabinet, although these may not occur in the immediate future. According to reports, officials most likely to be replaced include Postmaster General Summerfield and Defense Secretary Wilson, both of whom desire to return to private life. ODM Director Arthur Flemming is also expected to leave his post to reassume the presidency of Ohio Wesleyan University.

Revise Taft-Hartley Act?

Considerable speculation exists in Washington as to what changes the Administration plans to recommend in the Taft-Hartley Act. Labor Secretary Mitchell announced last month that a special message will be sent Congress on this subject. He indicated that the White House may renew its request for some 14 changes in the law which were proposed in 1954 but not enacted. Other Administration officials have declared that a change may be sought in the national emergency provisions of the law, to make them more flexible.

While Government labor experts have made it clear that changes in the Act will be recommended, they have been firm in stating that the Government will not ask for repeal of the provision which permits the States to enact laws banning the union shop and other contract provisions making union membership compulsory. Right-to-work laws are now on the statute books of 17 States, and labor union leaders have been trying for years to secure repeal of the Taft-Hartley provision permitting their enactment.

Mine Safety Hearings Close

A special House Labor Subcommittee on Mine Safety, headed by Rep. Metcalf (Dem., Mont.), concluded hearings last month on proposals to require Federal inspection of metal and nonmetallic mines and quarries. It made no recommendations for legislation on this subject, but recommended that the 85th Congress give further study to the matter and conduct investigations of safety and health conditions in Michigan, Alabama, Colorado, the Tri-State area of Kansas, Oklahoma and Missouri, and "such other places as a subsequent committee might find necessary."

During the hearings in Washington, D. C., a large number of mining industry witnesses appeared in opposition to Federal mine inspection. Speaking for the American Mining Congress, Charles E. Schwab, The Bunker Hill Co., told the Committee that statistics presented by the U. S. Bureau of Mines showed a regular and steady downward trend in both severity and frequency of accidents in non-coal mines, and declared that this improvement was attributable to the cooperative effort of the Bureau, the mining industry, employes and their unions, and the several States. He expressed the strong opposition of the Mining Congress to "any step that would tend to convert the Bureau of Mines, which is now of so much help to the industry and to the employes, into the status of a 'policeman.'" In place of the proposed legislation, Schwab said the Mining Congress recommended a strengthening of the health and safety programs now conducted by the Bureau of Mines in the metal and nonmetallic mining fields. He urged that adequate funds be provided to enable the Bureau to expand its staff and its activities for research in health and safety and improved techniques of mine accident prevention, and for mine safety education, and called for increased funds for the U. S. Pubic Health Service to expand its studies of occupational disease.

Another AMC witness, Orr Woodburn, Globe-Miami Rescue and First Aid Association, also opposed the proposals, terming them an invasion of States' rights and a "foot in the door" to compulsory compliance with orders of Federal inspectors. He pointed out that their enactment would create confusion and conflict and detrimentally affect the fine cooperation that now exists between U. S. Bureau of Mines personnel and the mining industry. He reiterated Schwab's recommendation that increased funds be provided for the U. S. Bureau of Mines and the U. S. Public Health Service.

Members of the subcommittee told the mining witnesses that they would strongly support a request for additional funds for expansion of present Government programs in the health

★ ★ ★ ★ ★ ★ ★ Washington Highlights

TAFT-HARTLEY: Administration seeks revision.
MINE SAFETY: Committee recommends study.
FREIGHT RATES: "Emergency" increase approved.
OIL IMPORTS: No curbs for present.
SEC REGULATIONS: AMC suggests revisions.
TAX REDUCTION: Unlikely this year.
POWER SITES: Mineral regulations proposed.

★ ★ ★ ★ ★ ★ ★

and safety field. It is understood that the Bureau of Mines has asked for a substantial increase in such funds in the new budget.

Other industry witnesses, who pointed up the the extensive work being done by the mining companies and by the States in safety matters, included William F. Eckert, Lake Superior Iron Ore Association; F. Cooper Green, Kennecott Copper Corp.; Miles P. Romney, Utah Mining Association; and J. T. Finlen and E. I. Renouard, The Anaconda Co.

Viewing the proposals in a different light, representatives of the United Steel Workers and the Mine, Mill and Smelter Workers urged approval of the proposed legislation and strongly recommended that it be amended to require compliance with findings of Federal mine inspectors.

Freight Rates Increased

In late December, the Interstate Commerce Commission granted "emergency" freight rate increases of 7 percent in the Eastern territory and 5 percent in the Western territory. Hearings on a 7 percent increase requested by Southern carriers were scheduled early this month and the Commission is expected to grant some boost. The Commission said that the rate hikes given Eastern and Western carriers would yield about $402 million. It gave no reason for the percentage difference granted carriers in the two territories. The ICC also granted a 5 percent rise on freight moving between any two of the three major territories—East, West, and South.

Exceptions to the general percentage increases were as follows: flat rate rises of 10 cents per ton on coal, 5 cents per ton on lignite, 50 cents per ton on potash, and 30 cents per ton on phosphate rock. Increases on a number of agricultural commodities were also limited to flat boosts.

The ICC scheduled further hearings on the railroads' request for an additional 15 percent rate increase.

Oil Import Curb Shelved

Decision by the Office of Defense Mobilization on a petition by domestic oil producers for a curb on oil imports has been shelved for the time being. ODM Director Flemming said the reason for this action was the situation in the Middle East and the Western European nations' desperate need for oil.

However, Flemming said that oil import plans of petroleum companies (which had been supplied his office), if carried out, would be contrary to the recommendations of the Presidential Advisory Committee on Fuel Supplies and Energy Resources and would "constitute a threat to our national security." He declared that this situation, in the absence of the Middle East problem, "would have left no course for me but to make a certification to the President under Section 7 of the Trade Agreements Extension Act of 1955." When the conditions abroad are alleviated, he said, oil importers will again be requested to provide information regarding their import programs, for review and a determination as to whether the planned oil imports would threaten national security.

SEC Merger Rules Opposed

The American Mining Congress last month expressed its opposition to a proposed revision of a Securities and Exchange Commission regulation under which any corporation, whether or not listed on a national securities exchange, would be required to file with and obtain SEC approval of a prospectus prior to soliciting the consent of its stockholders to merge, consolidate, reclassify its securities, or transfer its assets.

The Mining Congress told the Commission that adoption of the proposed regulations would constitute such a major revision of registration requirements that a decision in the matter should only be made by Congress, after full hearings.

The AMC pointed out that new discoveries of strategic and critical minerals are more often than not made by small groups of individuals, who attempt to develop their discoveries through small, closely held corporations whose securities are unlisted. When a discovery of consequence is made by such groups, added capital can usually be obtained only through merger, consolidation, or sale of assets to a larger corporation. These transactions, the AMC declared, are carried out on the basis of arm's length bargaining, and generally must be consummated without delay. For these reasons, it was pointed out, the proposed revision would seriously impede such transactions and be detrimental to the development of natural resources.

The Mining Congress also expressed its views on a proposed revision of SEC Regulation A, which governs stock issues of $300,000 or less.

It said that the exemption afforded under the existing Regulation "A," together with recent actions of the SEC to curb harmful stock promotions, seem to allow reasonable opportunity for small mining enterprises to obtain risk capital. The further restrictions now proposed by the SEC, AMC said, could materially hinder the raising of funds for legitimate mining development. Thus, it was pointed out, the proposed SEC requirement that an enterprise shall have shown a net profit in one of the five preceding years is obviously inapplicable to a new mining enterprise engaged in the search for and early development of mineral deposits.

It was also emphasized that the proposed limitation of 100,000 on the number of units that could be issued would call for an issuing price of at least $3 per unit if the enterprise is to avail itself of the full $300,000 exemption. This is a substantial departure from long-recognized practice in the sale of legitimate primary mining securities, the Mining Congress said, and in many cases might adversely affect the sale of such securities.

The SEC was urged to take every care to avoid action that would be harmful to the discovery and development of mineral deposits.

Tax Cuts Out

Testimony of Treasury officials before Congressional Committees, coupled with statements by key members of the House Ways and Means and Senate Finance Committees, all point to no general reductions in taxes this year.

The general consensus of those handling fiscal matters of the Government is that major tax cuts must be deferred so long as inflationary pressures remain high. Increased Federal spending brought on by the explosive foreign situation is another major deterrent to any wide-scale tax slash.

However, the Congressional tax-writing committees are taking a close look at the 1954 Revenue Code with a view towards clarifying its provisions and removing some inequities which have cropped up. Leading members of Congress freely predict that the present 52 percent corporate income tax rate and existing excise taxes will be extended beyond their April 1, 1957 expiration date. Doubts are also being expressed that tax relief will be given to small business enterprises, even though both political parties are on record as advocating such relief.

Representatives of the American Mining Congress and other mining organizations have called upon Congress to repeal the 3 percent excise tax on freight and the 4-cents-per-short-ton tax on transportation of coal. Congress is reviewing the various excise taxes, and it is generally hoped that it will remove these transportation taxes.

The Tax Committee of the American Mining Congress has been very active in recent weeks, not only in discussions with tax experts on Capitol Hill regarding revisions of the 1954 Revenue Code, but in discussions with representatives of the Treasury Department over proposed changes in the natural resources regulations under the Code. Among other things, the latter proposals represent an unwarranted departure from long-established standards for computing depletion allowances and the Mining Con-

(*Continued on page* 88)

AMC Personnel

L. C. Jones, chief engineer of the Utah Copper Division of Kennecott Copper Corp., has retired after nearly half a century of service with the copper mining company.

Joining the former Utah Copper Co. engineering department in 1908, Jones worked as chairman, rodman, instrument man, assistant mine engineer and mine engineer. In 1950 he was advanced to assistant chief engineer of the Utah Copper Division. He was made chief engineer in 1952.

With the exception of one year in railroad bridge and construction work for the Oregon, Washington Railroad and Navigation Co. in 1914 and two years with the U. S. Army during World War I, Jones has been continuously affiliated with the copper company.

C. J. Lindstrom has been appointed chief engineer of the Buckeye Coal Co. mine in Nemacolin, Pa., succeeding **Don Dowlin.** Lindstrom was formerly foreman at Buckeye's Mercer County strip mine near Mercer, Pa.

George E. Warren, president of Southwestern Portland Cement Co., Los Angeles, has been elected chairman of the board of directors of the Portland Cement Association at its annual meeting in Chicago. Warren has served on the board of directors since 1953 and as a member of the executive committee for the past year. He succeeds Emory M. Ford, chairman of the Huron Portland Cement Co., Detroit, who has served as chairman of the board of the association during the past two years.

Thomas O. Long, Madisonville, Ky., has been elected president of the Western Kentucky Mining Institute, succeeding Morton Jones, of Beaver Dam, Ky.

Thomas J. Hubbard has been appointed superintendent of the Magna plant of Kennecott Copper Corporation's Utah Copper Division, according to L. F. Pett, general manager. He succeeds **John Allan** who retired after 43 years of service with the Utah Copper Division. Hubbard was the former general master mechanic at the Magna plant, department of mills.

Dr. Charles Fairhurst, Ph.D. 1955 from Sheffield University in England, has joined the staff of the Department of Mineral Engineering at the School of Mines and Metallurgy, University of Minnesota. His principal research interest is in drilling of rocks.

Dr. Fairhurst is presenting the courses in mine plant engineering, and at the same time carrying on his research work in the field of rotary-percussive drilling of hard rocks.

Directors of Pittsburgh Consolidation Coal Co. have elected **Armstrong**

A. R. Matthews

G. H. Love

R. Matthews of Bluefield, W. Va., president, and named **George H. Love** board chairman.

Love has been president of Pitt-Consol for 11 years. Matthews has been president of Pocohontas Fuel Co., Inc., Pocahontas, Va., and will continue to serve as president of this company.

E. C. Sargent, for several years Cleveland area manager of the **Atomic Energy Commission,** has been elected president of **Zirconium Corp. of America.** He joined the company in February 1956 as vice-president and general manager and now succeeds **N. V. Coyle,** board chairman.

J. P. Williams, Jr., former chairman and president of Koppers Co., Inc., has resigned as a member of Koppers Board of Directors. Williams retired from active management of Koppers in May 1949 at the age of 65 but remained as chairman of the board of directors until 1950.

Williams formerly was a director of the Virginian Railway, the Fidelity Trust Co. of Pittsburgh, the Dollar Savings Bank of Pittsburgh and the Flannery Bolt Co. He first joined Koppers in 1920 as a mining engineer and later became president of the then Koppers Coal Co. In 1934 he was made a vice-president in the parent Koppers organization and in 1939 became its president. From 1944 to 1946 he held dual responsibility as chairman and president of Koppers.

Paul A. Mori has been named executive vice-president of the Cleveland Quarries Co., Amherst, Ohio, by action of the board of directors. Associated with Cleveland Quarries since 1911, Mori was elected a director in March 1955 and was named vice-president in June 1955, following 15 years as superintendent of the Amherst quarry. He is also executive vice-president and a director of Silica Chemicals, Inc., of Amherst.

O. Jalmer Anderson has been appointed chief mechanical engineer of the Cleveland-Cliffs Iron Co., Ishpeming, Mich.

His experience includes several years with Butler Brothers Mining Co., Nashwauk, Minn., as machinist apprentice, assistant master mechanic, concentrator superintendent and assistant mechanical superintendent.

Other major positions held by Anderson were district mechanical superintendent for the M. A. Hanna Co. from 1949 to 1951; master mechanic, Reserve Mining Co., 1951 to 1954; and consultant and design, Conveyor Belt Service, Inc., 1954 to 1956. He also spent a short period in plant design at the Western-Knapp Engineering Co.

David J. Crawford has become superintendent of mines, International Talc Co., Gouverneur, N. Y. He was formerly mining research engineer, Lehigh Navigation Coal Co., Lansford, Pa.

The promotion of **Dr. Richard A. Glenn** from research chemist to supervising chemist has been announced by Bituminous Coal Research, Inc. Dr. Glenn's experience includes research in nitrogen bases from petroleum for the Union Oil Co. of California, research on the isolation and utilization of nitrogen bases from coal tar for Pittsburgh Coke & Chemical Co.

James P. Haight has been named vice-president in charge of engineering and purchasing for the **Aluminum Company of America.** He succeeds **Thomas D. Jolly** who is retiring after 42 years with the company.

J. W. Pero, director of mine inspection and safety for Pocahontas Fuel Co., was elected president of Pocahontas Electrical and Mechanical Institute at the organization's recent annual dinner meeting in Bluefield, W. Va. Pero, who was elevated from first vice-president, succeeds S. S.

Cooper, retired chief electrician of American Coal Co., in the presidency.

After 25 years in official capacities with the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), **Edward H. Robie** has retired as secretary emeritus. A member of AIME since 1919, Robie became assistant secretary in 1932, secretary in 1949 and secretary emeritus in 1955.

Robie is editor of a supplement to "The Porphyry Coppers," by A. B. Farsons, which will be known as "The Porphyry Coppers in 1956" and which is expected to be published in 1957. He is editor-in-chief of a new volume on mineral economics which is likely to be published in 1958.

His early career was with the Canadian Copper Co. and International Nickel Corp. before he became assistant editor and later associate editor of *Engineering and Mining Journal.* He served also as associate editor of *Engineering and Mining World* and of *Metal and Mineral Markets.*

The Phelps Dodge Corp. has announced the election of **Charles R. Kuzell** and **Howard T. Brinton** as directors. Kuzell is vice-president in charge of operations in the West. Brinton is president of the Phelps Dodge Copper Products Corp., a fabricating subsidiary. Kuzell was general manager at Douglas, Ariz., from 1952 to 1955 when he was made vice-president in charge of western operations.

Chas. R. Kuzell

The appointment of **Lloyd S. Campbell** as assistant to vice president-operations and **John Chisholm** as general superintendent, Virginia-Eveleth district, has been announced by W. N. Matheson, vice-president of operations for U. S. Steel's Oliver Iron Mining Division.

Campbell, who will have his headquarters in Duluth, was assistant general superintendent of the company's Virginia-Eveleth district operations. Chisholm, previously assistant general superintendent of Oliver's Hibbing-Chisholm district, succeeds I. O. N. Swanson who is retiring.

Robert H. Seese has been appointed head of operations at Windber, Pa., by The Berwind-White Coal Mining Co. He succeeds John M. Kerr, general manager, who died October 24, 1956. Seese, formerly assistant general manager, was appointed to the new post pending appointment of a new general manager.

— *Obituaries* —

N. Porter Rhinehart, 64, chief of the West Virginia Mines Department from 1933 to 1942, died November 11. He came to West Virginia in 1916 and worked as a consulting engineer in Mt. Hope, where he also served as mayor from 1922 until 1928. At the time of his death, he was president of the Charleston Coal Co., a firm he organized after leaving his State position. It operated several mines in Fayette County.

Norman W. Pronger, 82, one of New Mexico's early day mining engineers, died November 8. Widely known in Southwest mining circles, he was one of the pioneer engineers who began development of Grant County's Chino mine at Santa Rita, now one of the world's largest open pit copper producers of Kennecott Copper Corp.

At the outbreak of the Spanish-American War, Mr. Pronger was a volunteer from New Mexico in the Roosevelt Rough Riders. After his military service, he went to Panama, serving for nine years as an engineer in the building of the Panama Canal.

Returning to Silver City, N. M., he was active in mining and in later years engaged in mining in Mexico and Arizona, retiring 20 years ago.

Roger I. C. Manning, 57, head of the Arizona State Department of Mineral Resources, died December 8. He had been director of the department since 1951 and before that had been affiliated with it for six years.

Marvin L. Kay, vice-president and general manager of Climax Uranium Co., Grand Junction, Colo., died December 7 of complications following an operation. A native of Council Bluffs, Iowa, and a graduate of the Colorado School of Mines, Mr. Kay was a widely respected personality in the western mining industry and was active in American Mining Congress activities.

H. Dale Barber, 64, of Silver Bay, Minn., a former Erie Railroad vice-president and executive in other enterprises, died October 18. A transportation expert, he went to Brazil for the World Bank on a survey of transportation after leaving his post with Erie. In 1934 he joined the Reserve Mining Corp., Silver Bay, as supervisor of rail transportation and held that position at his death.

Arthur J. R. Curtis, for many years in charge of the accident prevention bureau of the Portland Cement Association until his retirement in 1952, died November 10 at the age of 69.

Mr. Curtis joined the association in 1916 as director of extension. In 1926 he was appointed assistant to the general manager of the PCA, in charge of its accident prevention bureau, and served in this capacity until August 1951 when he was made assistant secretary and safety consultant. During these years he was responsible for numerous innovations promoting safety in member company mills and quarries, and accident frequency in these plants was greatly reduced. Recognition of his leadership in this field came in 1947 when he was awarded the Joseph A. Holmes medal of the U. S. Bureau of Mines.

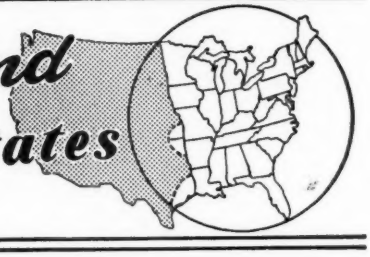
Mr. Curtis was nationally known in industrial safety circles. For 16 years he served as secretary of the cement section of the National Safety Council, and for many years was a member of the executive committee and of the board of directors of that organization. He was a member of the President's Conference on Industrial Safety, the Industrial Hygiene Foundation, American Industrial Hygiene Association, the American Society of Safety Engineers, and a past president of the American Society of Agricultural Engineers.

C. Henry Harman, 67, long a prominent coal operator in southwest Virginia and southern West Virginia died November 3. At the time of his death, Mr. Harman was president of the Yukon Pocahontas, the Sayers Pocahontas, and the Buchannon Coal companies. These companies operate large leases in Buchannon County, Virginia.

Fred M. Wells, 96, died in Vancouver, B. C. He started his mining career in 1882 and for 74 years has worked constantly to locate and develop mining areas.

Mr. Wells was honored by a town named for him at Wells, B. C., near Barkerville, where he discovered and promoted the Cariboo Gold Quartz mine. Other successful ventures were discovery and development of Surf Inlet Gold Mine on Princess Inlet, Paradise Mine near Windermere, and the establishment of the first assay office at Rossland.

Eastern and Central states



Sees Rise in Coal Demand

Raymond E. Salvati, president, Island Creek Coal Co., said that "billions of dollars in new capital will be required to meet the mounting demand for coal within the next decade," in a recent speech before the New York Society of Security Analysts. Salvati estimated a total coal demand of 602,000,000 tons by 1960 and 728,000,000 tons by 1965, compared with 478,000,000 tons produced in 1955.

Individual markets in which the greatest growth is expected are utilities, estimated at 290,000,000 tons by 1965, industrial at 165,000,000, coke ovens to supply steel plants at 133,000,000 and export at 90,000,000 tons. The retail market, which has been declining over the past ten years, is expected to level off at about 50,000,000 tons.

Meanwhile, the National Coal Association has estimated bituminous coal production for 1957 at 532,000,000 tons, or 22,400,000 tons more than the estimated total for 1956.

Expands Gypsum Operations

National Gypsum Co., Buffalo, N. Y., which this year completed five new plants and a large-scale expansion of a sixth, is now undertaking a $19,000,000 Great Lakes area expansion program involving the construction of two gypsum building-products plants and the development of a 75,000,000 ton northern Michigan gypsum deposit. The Michigan deposit will provide raw material for the new plants.

Construction of the plants, docks and harbors will get under way next summer; lake ore-ships will transport the raw gypsum from the deposit to the plants for processing into a number of gypsum products.

The company this year also put its new Atlantic fleet of gypsum ore carriers into operation.

Overland Conveyor Belts Installed

A conveyor belt has been placed in operation over Western Kentucky's hills by the DeKoven mine of Pittsburg & Midway Coal Mining Co. to haul mined coal to the Ohio River. The conveyor system moves coal 2½ miles over heavily wooded hills at a rate of 900 tons an hour to barges on the river.

The company conveys raw coal by belt from its mechanized mine to a coal preparation plant located at about the half-way point to the river, then on to the river for barge loading.

The mine-to-preparation plant run consists of three flights of 36-in. wide conveyor belting, ranging in length from 1650 ft to 3100 ft. Three more cross-country flights of 42-in. wide conveyor belting, ranging from 1700 to 2500 ft in length, are used to move prepared coal to the river.

Asbestos Project

American Smelting & Refining Co., New York, is spending approximately $32,000,000 to develop its Lake Asbestos of Quebec, Ltd., properties in what has been termed one of the most unusual mining ventures in the history of the asbestos industry. To reach the ore bodies, which lie 70 to 200 ft beneath the waters of Black Lake, Asarco is draining the one-half mile wide, two-mile long body of water. When removal of the overlying water and solids is completed, the asbestos ore will be mined by open-pit methods.

Annual output of high-grade asbestos fibre will run about 100,000 tons, and proved reserves are sufficient to support the proposed mill output for at least 40 years.

Safety Citation Awarded

Seven hundred and fifty miners and foremen at Harewood mine of Semet-Solvay Division, Allied Chemical & Dye Corp., were honored for their 100 percent participation in the U. S. Bureau of Mines accident prevention course at a ceremony recently in Montgomery, W. Va.

Certificates signifying a successful completion of the course by every man on the payroll were presented to C. V. Hunt, mine superintendent, and Bracie Clark, president of UMWA Local 7113, by the U. S. Bureau of Mines, State Department of Mines, and the UMWA International Union.

Merger Is Effective

Acquisition of Pocahontas Fuel Co., Inc., by Pittsburgh Consolidation Coal Co., Pittsburgh, through an exchange of stock has been declared effective. Pitt-Consol announced that shareholders representing more than 85 percent of the 1,020,456 outstanding shares of Pocahontas common stock have accepted its exchange offer, thus making the exchange effective.

To Build Aluminum Plant

Federated Metals Division of American Smelting & Refining Co., New York, has announced that it will begin construction of a large secondary aluminum smelter at Alton, Ill. The plant, which will have an annual capacity of 72,000,000 lb of aluminum alloy ingot, will double Federated's present aluminum alloy production and will be among the largest plants ever built to handle aluminum scrap metals.

The modern smelter will include self-sufficient laboratories containing quantometric and chemical testing facilities.

Approves Lighting Systems

U. S. Bureau of Mines has approved two commercially made lighting systems as permissible for safe use in gassy or dusty coal mines, according to Secretary of the Interior Fred A. Seaton.

"These approvals, granted after rigorous testing, fulfill a need that has existed since mining of coal began and may bring about one of the greatest advances in mine safety in recent times," Marling J. Ankeny, Bureau Director, reported to Secretary Seaton.

Heretofore the only light available in the face areas where miners spend most of their working time has been provided by the beams of their electric cap lamps and the headlights of mining machinery.

The fixtures of the two approved systems each take advantage of the intrinsic safety of fluorescent tubes when used in an instant-start circuit. They are about 18-in. high and six in. in diameter, and each has two 14-watt fluorescent lamps mounted side by side in a transparent plastic tube.

The fixtures are designed to be suspended vertically and to be spaced at about 18-ft intervals. A magnetic lock prevents unauthorized replacement of lamps or tampering, and a short cable and special plug on each fixture permits lights to be added easily as mining advances.

The first approval covers a two-wire distribution system for the lights. This is isolated from all other mine circuits by a transformer or a motor generator; like home lighting systems, it uses 120-v alternating current.

The second approval covers a three-wire distribution system, with the third wire used to ground the metal frames of all parts.

Copper Production Slated

Maritime Mining Corp. will begin the production of copper concentrates this year at its Newfoundland copper bearing property. Maritime, which reopened old workings at its Tilt Cove site on Notre Dame Bay in 1954, expects to produce concentrates at the rate of 2000 tpd to start. It will ship the concentrates by boat to a smelter point not yet designated.

The Tilt Cove mine field was first opened in 1864 and worked until 1917. It was idle until 1954 when it was reopened, sampled and diamond drilled.

Conveyor, Shop Burn

A conveyor and shop of the Cambridge Smokeless Coal Corp. mine at Page, Va., was destroyed by a forest fire early in November. The mine tipple was destroyed in a fire on October 31, and officials estimated damage from both blazes at $400,000.

Employes said the tipple, conveyor and shop will be rebuilt and estimated it would take ten months to a year to get the mine back into operation. The mine has a capacity of about 5000 tons of coal per day.

Iron Ore Shipment

Great Lakes iron ore carriers last season carried some 9,827,000 tons less than in 1955, the Lake Superior Iron Ore Association has reported. Shipments totaled 77,633,027 tons up to December 24, 1956.

To make up as much as possible of the ore loss resulting from a 70-day strike of steelworkers during the summer, and because of better than usual conditions on the Great Lakes, ore shipments continued beyond December 10, while normally the season ends during the first week in December.

Anthracite Wage Agreement

Anthracite producers and United Mine Workers of America have been operating since December 1 under an agreement providing for wage increases ranging from $1.50 per day for all inside and outside company men to $2 per day for all producing miners, consideration miners and laborers.

Another provision of the agreement, which affects approximately 30,000 employes who are UMWA members, is an increase in the vacation payment from $100 per year to $140. The agreement also provides for time and a half or rate and a half for Saturday work and double rate for Sundays and holidays.

Acquires Vitreous Properties

Eagle-Picher Co., Cincinnati, has purchased all of the assets and properties of Chicago Vitreous Corp. and Lusterlite Corp., an affiliated company. Chicago Vitreous, a producer of porcelain enameling frits, will operate as a division of The Eagle-Picher Co. under its present management.

Coal Lands Purchased

Pocahontas Fuel Co., Beckley, W. Va., has purchased 20,000 acres of Raleigh County W. Va., coal land at an undisclosed price. The property is in Clear Fork and Marsh Fork, and is virtually undeveloped. The sale included all surface and mineral rights except commercial timber.

Farmington Mine Reopened

Jamison Coal & Coke Co., Fairmont, W. Va., has resumed full production at its No. 9 mine at Farmington. The mine previously had been in partial operation following an explosion more than two years ago.

New Africa Bauxite Source

Aluminum Ltd., Montreal, Canada, is planning to establish a new $100,000,000 bauxite and alumina industry in French West Africa to serve export markets. The project, southeast of Dakar, will be handled by a French subsidiary of the Canadian firm and ultimately will employ several thousand persons.

European Coal Needs

Coke and coal is becoming increasingly important to Western European industry, according to a European economist visiting the United States. Coal imports from the United States will reach $800,000,000 this year, according to Rene Sergent, secretary-general of the 17-nation Organization for European Economic Cooperation (OEEC).

The greatest need is for coking coal, Sergent said, and imports have nearly doubled since last year. Considerable tonnages of Southern West Virginia low-volatile coals are being shipped to Europe this year.

He said coal is getting scarce and more difficult to mine in the Western European countries; seams of coal are so thin that it takes eight to ten years to get a mine into paying production.

The OEEC has been studying energy needs and is promoting atomic power development, he said. An atomic power station has been opened in Great Britain and one will open in France next spring. Sergent said that he hopes in ten years atomic power will be able to compete with coal.

Safety Drive Begun

An all-out campaign to train miners to protect themselves against underground hazards has been launched at Tralee mine of Semet Solvay Division, Allied Chemical & Dye Corp., with a ten-week course in coal-mine accident prevention conducted by the U. S. Bureau of Mines. Management officials and officers of the UMW local are cooperating to have about 530 miners and foremen trained in the course.

Position Open

National association in Washington, D. C., offers fine opportunity in convention, trade show and advertising work. Man under 40, with some drafting ability preferred. Knowledge of mining helpful, but not essential. Send resume, photo, references and salary required. Box 157, c/o Mining Congress Journal, 1102 Ring Bldg., Washington 6, D. C.

Biggest Lake Vessel

Columbia Transportation Co., an ore-hauling company operated by Oglebay, Norton & Co., Cleveland, will lease for 25 years the longest and largest vessel on the Great Lakes as soon as it is built. Costing more than $7,000,000, the boat will be started early this year at the Detroit yard of Great Lakes Engineering Works, for Northwestern Mutual Life Insurance Co., Milwaukee. It is to be completed in 1958.

Still unnamed, the vessel will be 729 ft long, have a beam of 75 ft, and will be 39 ft deep. At maximum draft, it is to haul 25,000 gross tons of iron ore. With coal-fired boilers and a steam turbine having 7500 hp at the shaft, the vessel is expected to move about 16 mph loaded.

Columbia Transportation has a fleet of nine bulk vessels, seven self-unloaders and five crane-equipped ships.

Coal Heating Values

Heating value and other characteristics of coal produced by more than 600 mines in 19 states and Alaska are shown in a recently released U. S. Bureau of Mines publication. The report presents analyses made in Bureau laboratories of nearly 10,000 coal samples taken either at mine tipples or from shipments delivered to Government agencies during fiscal 1955.

These analyses, specifying the heating value and composition of the coal sampled, are made for the use of the Federal Government, but they also are used extensively by private industry in buying coal.

Authors of the report are S. J. Aresco, chief, Fuel Inspection Service, C. P. Haller, supervising solid fuels mining engineer, and R. F. Abernethy, chief, Analysis Section, all of the Bureau's Branch of Bituminous Coal at Pittsburgh, Pa. They have tabulated the analyses alphabetically by State, county, town, and mine. States represented in the report are Ala., Colo., Ill., Ind., Iowa, Kans., Ky., Mo., Mont., N. M., Ohio, Okla., Pa., Tenn., Utah, Va., Wash., W. Va., and Wyo.

A copy of Report of Investigations 5270 can be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

Safety Committee Set Up

A joint safety committee composed of four representatives of management and four representatives of labor has been established at the Deerfield Mine of American Coal Co., Covel, W. Va. The committees' objective is coal mining without death or injury, an object which it hopes to achieve by the rehabilitation of unsafe workers and the promotion of safety in general at the operation.

—BOOK REVIEWS—

MINES REGISTER. *Bardeen Press, Inc., 425 West 25th St., New York 1, N. Y. $25*

THE 1956 Edition of the Mines Register (Volume XXV) contains the latest available information on more than 5000 active mining companies in the Western Hemisphere that produce precious, semi-precious, and nonferrous metals. The report gives the location of the mine; the history of the company; the names and addresses of its officers, mining personnel, and purchasing agent; the company's capitalization, earnings and dividends for the past few years; a description of the property, its equipment and production for the past few years; its ore reserves and the number of men employed. The book lists more than 20,000 inactive mines and their location.

Special sections are devoted to statistical data of the metal industry, mining company securities, the exchanges on which they are listed, and the price ranges for the years 1947 to 1955, inclusive.

A comprehensive buyers' guide is included that lists mining machinery, equipment and supplies that are used in mining operations and the names and addresses of the manufacturers of such equipment.

Size of the book is 6 by 9 in. It is clothbound and contains approximately 800 pages.

MAN'S ROLE IN CHANGING THE FACE OF THE EARTH. *Edited by William L. Thomas, Jr., The University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill. $12.50.*

THIS book is said to be the first large-scale evaluation of what has happened and is happening to the earth under man's impress.

In June 1955, an international symposium organized by the Wenner-Gren Foundation for Anthropological Research was held at Princeton, N. J. It was devoted to the new interdisciplinary concern about the earth as it has been modified by human action. The results of that symposium are the subject of this important volume.

The book is divided into three parts: retrospect, process, and prospect. The discussions under retrospect are concerned with the historical aspects of man's dominance of the earth. Those under process deal with man's impact on the sea, changes in the water economy, changes in slope and soil through human use, modification of biotic communities, the ecology of wastes, and urban—industrial demands on the land. Under prospect, consideration is given to the environment limitations of the earth, possibilities of new energy sources, the growth of the world population, and finally to the esthetic, ethical, philosophical, and legal values that are involved in man's relationship with nature.

The chief importance of this volume is, perhaps, its acute observation of the past and anticipation of the future.

BITUMINOUS COAL TRENDS 1956. *National Coal Association, 802 Southern Building, Washington 5, D. C.*

THIS 164-page illustrated book records and documents the changing patterns in the coal industry, pointing up coal's place as a vital energy source. It is the successor publication to Bituminous Coal Annual, the sixth and final edition of which was issued in 1953.

In addition to chapters on energy and markets, Trends contains chapters on production, transportation, labor, safety, research and reserves. Forty-five photographs illustrate modern production, safety and transportation methods in the increasingly mechanized coal industry. These are supplemented by 50 statistical tables and more than 30 graphics illuminating progress of the industry and trends.

First run of Trends is 20,000 copies which will be distributed free to the industry, members of Congress and public officials. The cost is one dollar per copy for quantity lots, single copies free upon request.

NEMA PUBLICATIONS, *National Electrical Manufacturers Association, 155 East 44th St., New York 17, N. Y.*

TWO publications of greatest interest to the mining industry have recently been released by NEMA. They are: "NEMA's Standards Publication for Mining Belt Conveyors, MB1-1956;" and "NEMA Standards Publication from Mining and Industrial Electric Locomotives, MI 1-1956."

THE MINING JOURNAL ANNUAL REVIEW, *the Mining Journal, Ltd., 15 Wilson St., London, E. C. 2, England, $1.00.*

THE 1956 edition of the Annual Review of the Mining Journal is now available. The Review records technical progress in all branches of the mining industry in the world. In its economic aspects the Review records the industry's progress both metal by metal and country by country.

EXPLORATION FOR NUCLEAR RAW MATERIALS. *Edited by Robert D. Ninger, D. Van Nostrand Co., Inc., Princeton, N. J. $7.50.*

AT the International Conference on the Peaceful Uses of Atomic Energy in Geneva, with respect to the field of raw materials for nuclear fuels, 26 countries presented 125 papers on the subject of uranium and thorium geology and exploration. A selection of 33 of the most significant papers has been used as the basis for this volume.

The subject is developed in logical sequence through the basic principles of nuclear geology to geologic, geochemical and geophysical techniques of prospecting. Included are details of surface, subsurface, and aerial radiometric methods, with special emphasis on their uses in the United States, the U.S.S.R., Canada and Brazil; hydrogeochemical and combined geophysical and geochemical methods, as well as of botanical prospecting and its applications. Carefully selected references for the principal subjects supply an invaluable guide to relevant existing literature.

Covering the world, with contributions from distinguished scientists of many nations, this is one of the most thorough and up-to-date handbooks on exploring for uranium and thorium yet available.

Wheels of Government

(*Continued from page* 81)

gress has registered its opposition to the changes.

Power Land Regulations Proposed

The Bureau of Land Management has issued proposed regulations governing the administration of Public Law 359 of the 84th Congress, which opened lands withdrawn for power sites to mineral location.

The regulations, as proposed, contained several restrictions which the mining industry believes are not in line with the intent of Congress. The American Mining Congress has filed statement with the Bureau objecting to some of the provisions, including one which would require any claimant locating on power site lands to state in his location notice that the filing was made under terms of Public Law 359. The AMC said that Congress never intended to require such a statement, which would simply add a technicality upon which the validity of such a claim could be questioned. It was pointed out that no such requirement had been imposed under previous public land laws, such as the Multiple Mineral Development Act and the Multiple Use Act.

The Bureau of Land Management is now considering the AMC recommendations for changes in the proposed regulations.

Western States

Shaft-Sinking Record

A new Coeur d'Alene mining district shaft-sinking record has been reported at the Silver Mountain deep development project east of Mullan, Idaho. Three crews, working six days weekly, sank the three-compartment vertical shaft 2000 ft in less than ten months for an average daily advance of 9.3 ft.

Lee Messerly supervised the work for Hecla Mining Co., which is carrying out the project as a joint venture with the Bunker Hill Co. under an operating agreement with Silver Mountain Lead Mines, Inc.

A station, from which exploration work will be done, is being cut at the 2000-ft point. The shaft then will be deepened 100 ft for sump and other facilities. Plans call for driving a cross-cut tunnel about 1200 ft north of the shaft to a mineralized zone and tunneling along its east-west trend for some 6000 ft.

The adjoining Princeton Mining Co. claims will be explored from the Silver Mountain workings.

Protects Coal Title

Kaiser Steel Co. has insured title to a vast acreage of coal land in northeastern New Mexico. Under the policy, the largest of its kind to be written in New Mexico, the company would be reimbursed to the extent of $3,500,000 if the title to the coal land proves invalid. Covered are over 200,000 acres of fee land and coal rights on more than 300,000 additional acres. The insurance was underwritten by five insurance companies at an undisclosed premium. The coal properties, located in Colfax County near Raton, were acquired by Kaiser to insure future operations of its steel plant at Fontana, Calif.

Glacier Peak Copper

Bear Creek Mining Co., a subsidiary of Kennecott Copper Corp., has made a third payment of $75,000 on the Glacier Peak copper property in northeastern Snohomish County, Wash. This brings to $120,000 the total payments made to Glacier Peak Mining & Smelting Co. since Bear Creek started exploration work in 1953.

According to Lowell B. Moon, mining geologist in charge of Bear Creek's Spokane district office, more than 5000 ft of diamond drilling was done in eight holes this year between June 1 and October 1. All transportation to the mile-high property was by helicopter over an 18-mile course. A crew of 25 was employed.

Uranium Exploration

Phillips Petroleum Co. has signed an agreement to conduct 20,000 ft of drilling for uranium ore on a state school section in McKinley County, N. M., in which four smaller firms have interests, according to Ted Ludlow, president of Strategic Metals Research, Inc., Salt Lake City. The other three firms are: Producers Uranium Corp., Mayflower Co., and Congress Uranium Corp.

Manitoba Nickel

International Nickel Co. of Canada, Ltd., is reported to be ready to proceed with the transition of its Mystery-Moak Lakes nickel ore discovery in Manitoba, into one or more mines. The property, located in the northern part of Manitoba, is about 400 miles north of Winnipeg. It is a large nickel bearing ore body with traces of copper, and contains some of the metals in the platinum group as well as some gold and silver.

It is reported the mine will become the world's second largest nickel producer, exceeded only by International's major nickel mine in the Sudbury area of Ontario.

Present plans call for the over-all expenditure of approximately $150,000,000 to bring the property into production by 1960 at an initial rate of from 50,000,000 to 60,000,000 lb of nickel a year.

Borax Research Lab

Borax & Chemical Corp. has obtained a building permit to construct a research laboratory at Anaheim, Calif., at an estimated cost of over $800,000. The firm will conduct research into new uses for borax in industry, defense production and domestic uses.

Bunker Hill Acquisition

President John D. Bradley of the Bunker Hill Co., San Francisco, has announced the acquisition of the Associated Lead & Zinc Co. of Seattle, Wash., formerly jointly owned and operated by Bunker Hill and Eagle-Picher Co. of Cincinnati.

Associated becomes the Chemical Products Division of Bunker Hill, and will continue to manufacture a variety of lead and zinc products, principally lead oxides, litharges and red lead. It will also continue to act as West Coast sales agent for Eagle-Picher's Chemical Division. Roger H. Cutting, formerly Associated president, was recently elected vice-president of Bunker Hill, and Harry L. Von Eschen, the former secretary and assistant treasurer of the acquired company, is division controller of the parent company.

Potash Shafts

E. F. Kindsvater, president, Farm Chemical Corp., has announced that bids have been called for on a 1700-ft shaft to be sunk on the firm's potash acreage east of Carlsbad, N. M. A joint venture of the National Farmers Union, Kerr-McGee Oil Industries, and Phillips, the company expects to be producing potash by 1958.

New Mexico Uranium Deal

Phillips Petroleum Co. has purchased a quarter interest in a uranium deposit, owned by Holly Uranium Co., for a reported consideration of $1,750,000. The acreage, located in the Ambrosia Lake district, is estimated to contain 1,500,000 tons of ore. Phillips has indicated an interest in building a mill to process the ore.

Korean Loans

Korean gold mines will be assisted by recent loans granted by the United Nations Korean Reconstruction Agency (UNKRA) from a revolving fund set up to assist small mining enterprises.

The loans were made on advice of UNKRA mining engineers who reported potential ore reserves of 21,500 metric tons and estimated that the mine had a possible life duration of five years. The loan involved funds of $50,000 for the import of equipment and a further loan of 6,250,000 HWAN in local currency to help the operation pay local expenses.

Wyoming Uranium Mill

The Atomic Energy Commission and Lucky Mc Uranium Corp. of Salt Lake City, Utah, have signed a contract for the construction and operation by Lucky Mc of a uranium processing mill in the Gas Hills area of Fremont County, Wyo. The proposed site of the mill is approximately 50 miles southeast of Riverton.

The construction of the new mill is expected to be completed in about 12 months. Design and engineering for the plant were performed by Utah Construction Co., a principal stockholder of Lucky Mc.

In addition to processing uranium ore from properties owned or controlled by Lucky Mc, a certain amount of amenable ores will be purchased from independent producers of the Gas Hills area. The uranium concentrate produced by the mill will be sold to the commission under the terms of the contract.

Canadian Columbium

Consolidated Mining & Smelting Co. of Canada has announced that it is joining with Power Corp. of Canada, Ltd., in a large columbium mining venture in northern Ontario. The two companies have agreed to purchase 1,500,000 shares of Beaucage Mines, Ltd., which has large tonnages of the mineral. Cominco will supply management and technical direction for Beaucage, which recently completed a pilot plant for treatment of its columbium-bearing ores.

Richardson Heads New Mexico Mining Association

James K. (Jim) Richardson, assistant general manager of the Chino Mines Division, Kennecott Copper Corp., was elected president of the New Mexico Mining Association at the annual meeting of members in Carlsbad on November 2.

J. K. Richardson

R. G. Haworth, vice-president, production, Potash Company of America, was elected first vice-president, and T. O. Evans, chief mining engineer, A.T. & S.F. Rwy., was named second vice-president of the association.

The following were elected at the Carlsbad meeting to serve for one year as members of the executive committee of the association: F. O. Davis, T. O. Evans, W. H. Goodrich, A. L. Greslin, J. K. Richardson, J. H. Taylor, and A. J. Thompson. Directors elected to serve three years (until 1959) were: A. B. Bowman; F. O. Davis; Tom Ferguson; W. H. Goodrich; H. C. Hirsch; B. B. Kunkle; J. I. Moore, Jr.; W. D. Stone; and W. C. Waidler. Horace Moses was nominated from the floor to be a director, succeeding himself, and elected unanimously.

Several directors have moved from the State and indicated that they would not be in position to participate in further activities of the association; each recommended the selection of a State resident to fill the unexpired term. The following were elected to replace those directors: Earl H. Miller to succeed H. H. Bruhn (term expires 1957); Ed. C. Skinner to succeed Carl A. Arend, Jr. (term expires 1957); W. Aubrey Smith to succeed F. H. Stewart (term expires 1957); and A. J. Fitch to succeed John B. Knaebel (term expires 1958).

Low-Grade Chrome Ore Treatment

Chromite from low-grade domestic deposits, such as those in Oregon and Montana, can be treated to yield satisfactory alloying material for steelmaking, the Bureau of Mines has disclosed.

A technical report released by the Department of Interior describes tests in which various chrome-based alloying materials were produced by electric smelting at the Bureau's Albany, Ore., laboratory. Steel companies to which samples of these were sent used them in regular production runs and reported them satisfactory. In some of the Albany tests, ferro-chrome-silicon-manganese was made, with the manganese added by including off-grade siliceous manganese ore in the electric-furnace charge.

Some of the concentrates used in the tests came from deposits near Coquille, Ore., but most samples were obtained from Montana's Stilwater and Sweet Grass Counties.

A copy of the report, R.I. 5268, "Electric Smelting of Low-Grade Chromite Concentrates," can be obtained by writing to the Bureau of Mines, Publications-Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

Idaho Silver-Lead Deal

Federal Uranium Corp. of Salt Lake City has entered an agreement to operate the Conjecture silver-lead mine at the south end of Pend Oreille lake near Lakeview, Idaho. Federal will have a five-year option to acquire half interest in the operation. Terms of the agreement provide that Federal will spend up to $200,000 in enlarging the shaft and deepening it to the 700-ft level. In addition, a minimum of 600 ft of drifting will be done at the new level.

Mining Taxes

Utah Division of Kennecott Copper Corp. has paid the State of Utah $9,-121,932 in property taxes for 1956. This figure represents the biggest single corporate tax to be paid in the history of the State.

The tax payment was based on a total company property valuation of $250,669,117 for 1956. This figure was triple the property valuation ten years ago, company officials pointed out.

Kennecott's total Utah taxes, including franchise (corporate income), sales and mine occupation will be $12,-556,937 this year in Utah. The largest share of this tax payment, over $8,-000,000, will go to public schools. Substantial amounts will go to the State's uniform school fund for distribution to the various school districts.

Meanwhile, Kennecott's Chino Mines Division at Hurley, N. M., has paid the first installment of its 1956 State and county taxes — a bill which amounts to more than ⅔ of the total taxes levied in Grant County, and one of the largest paid by any single taxpayer in New Mexico.

The payment of $417,056 covered the first half of 1956 and is 50 percent of the tax assessed the Chino Mines Division for the year. Chino was assessed 68 percent of the total Grant County taxes.

The State and county property taxes are less than half of the total taxes which Kennecott will pay in New Mexico. In addition to this amount, Kennecott will pay income tax, severance tax, franchise tax, sales tax, use tax and unemployment tax.

Continental Diversifies

Continental Uranium, Inc. has announced the acquisition of three companies in the building supply field. The three concerns are the Transit-Mix Concrete Co. and the Daniels Sand Corp., both of Colorado Springs, Colo., and the Pacific Materials Corp. of St. Louis. Purchase price and terms were not disclosed.

Gerald Gidwitz, Continental board chairman, said these acquisitions continue Continental's program to diversify into the building materials and non-metallic mining fields, and that negotiations are currently under way with several other similar companies. Continental owns and operates uranium properties in the Colorado Plateau and Wyoming, as well as silica mining interests in Kentucky.

Calumet & Hecla Discovery

Calumet & Hecla has discovered "a substantial body" of uranium ore about 18 miles northeast of Grants, N. M., according to Endicott R. Lovell, president. The discovery is in the eastern part of Ambrosia Lake district in which several discoveries have been made previously by other companies. Lovell said that C & H has "several thousand acres" of leases in that area.

The C & H discovery is in the Poison Canyon Sandstone, at an average depth of 180 ft. Lovell said that mining operations cannot be started until the extent of the ore body has been outlined and extensive negotiations for milling arrangements have been completed.

Shasta Copper Exploration

Phelps Dodge Corp. has signed an exploration and mining agreement with Shasta Copper & Uranium, Inc., of Salt Lake City, calling for a minimum expenditure of $150,000 per year for a five-year period on 250 mining claims in the West Shasta mining district, 15 miles north of Redding, Calif. Exploration will center around the old Balakalala, Shasta King, and Sugar Loaf mines.

Gunnison Uranium Mill

Gunnison Mining Co., Grand Junction, Colo., and the Atomic Energy Commission have signed a contract for the sale of uranium concentrates to be produced by a new uranium processing mill to be erected near Gunnison, Colo. Construction of the new plant, to be owned and operated by the Gunnison Mining Co., will start immediately and completion is scheduled in about one year. The new plant will treat uranium ores from the Gunnison district, including ores from the Los Ochos properties developed by Gunnison.

Uranium Handbook

The Bureau of Mines has published a new handbook for uranium prospectors.

The handbook includes information on how to obtain analyses of ore specimens, prospecting on private and public lands, ways of staking claims, use of Geiger counters, and other data.

The book can be obtained for 70 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Black Bear Buys New Property

Black Bear Consolidated Mining Co. announced in late December the purchase of 13 new claims and the acquisition of stock in the Tonopah 76 Consolidated Mining Co.

The acquisition of 13 claims in the Marysvale, Utah, uranium area, gives Black Bear a total of 32.

In the Tonopah 76 transaction, Black Bear exchanged ownership of the Sweden-Norway Mine, a copper property near Mt. St. Helens, Wash., for cash and stock in Tonopah 76. Added to the stock previously held, the purchase brings Black Bear's holdings to about 28 percent of the total outstanding shares in Tonopah, making it the largest individual stockholder.

New Mexico Potash

Richard C. Wells, president of National Potash Co., has reported that the company's two shafts are down to the ore zone, and that the 21-mile water pipeline is now in operation. It is expected, he said, that the plant will be in production by February 1957.

A joint venture of Freeport Sulphur and Pittsburgh Consolidation Coal Co., the $19,000,000 project will have an annual capacity of 40,000 tons of muriate containing 60 percent K_2O. Storage facilities are being provided for 100,000 tons of finished product. The plant will be located in Lea County, N. M., near Carlsbad.

Mexico Mine Production

Mining production in Mexico increased by nine percent in 1955 over 1954, while manufacturing showed an 11.5 percent gain, petroleum a 7.2 percent gain, and refined products a 4.7 percent increase.

Texas Rotary Kiln

Construction of a 300-ft rotary kiln at the Texas Portland Cement Co. plant at Orange, Tex., has been completed and production started. The multi-million dollar rotary kiln was designed and fabricated by Kennedy-Van Saun Manufacturing & Engineering Corp. of New York. Twenty-seven freight cars were required to transport it to Orange.

A.M.C. Annual Meeting

(*Continued from page 67*)

Counsel, gave his views on the over-all economic and monetary situation of the nation.

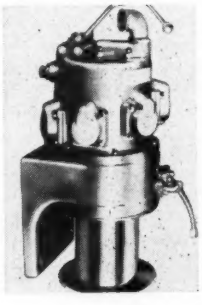
Nominations for directors of the American Mining Congress were submitted by C. Jay Parkinson, chairman of the Nominating Committee. They included, for a one-year term, George J. Clark, president, Reading Anthracite Corp.; for a two-year term, Clyde E. Weed, president, The Anaconda Company; and for three-year terms, Louis S. Cates, chairman of the board, Phelps Dodge Corp., Andrew Fletcher, president, St. Joseph Lead Co., George B. Harrington, Chicago Wilmington & Franklin Coal Co., H. C. Jackson, managing partner, Pickands Mather & Co., L. J. Randall, president, Hecla Mining Co., Raymond E. Salvati, president, Island Creek Coal Co., Walter A. Wecker, president, Marquette Cement Manufacturing Co., and Jack H. How, president, Western Machinery Co. These nominees were duly elected and all principal officers were reelected for 1957. The officers include Howard I. Young, president; Worthen Bradley, Raymond E. Salvati and Andrew Fletcher, vice-presidents, and Julian Conover, executive vice-president and secretary.

Manufacturers Forum

Hoists

TWO AIR-POWERED HOISTS with maximum load limits ranging from 1100 to 2200 lb have been announced by Atlas Copco AB.

Designated the Atlas Copco MHG-41 and MHK-61 Hoists, the units have rope speeds ranging from creep up to 160 fpm at full load. Both hoists operate at air pressures of 85 psi.



The 265-lb MHG-41 operates from a one-in. air line and can lift up to 1100 lb. Equipped with 400 ft of 5/16-in. wire rope, the rope drum of the MHG-41 is 7⅞ in. wide and has a 6⅞-in. diam. Motor output is rated at approximately 6.2 hp.

The 530-lb MHK-61 which has a motor output of approximately 13.2 hp can handle 2200-lb loads. Operating from a 1½-in. air line, the rope drum of the MHK-61 is 9⅞ in. in width and has a 9¼-in. diam. It is equipped with 460 ft of 7/16-in. wire rope.

Hoists are available from Atlas Copco Eastern, Inc., Paterson, N. J., and from the Atlas Copco Pacific, Inc., San Carlos, Calif.

Fog Nozzles

A LINE OF HARD RUBBER FOG NOZZLES has been announced by the Bete Fog Nozzle, Inc., Greenfield, Mass. The nozzles are claimed to be

non-clogging, corrosion resistant with practically any spray, long-wearing and inexpensive.

The HR Series nozzles utilize the manufacturer's spiral design and are of one-piece construction. They are available in ten models with narrow angle (50°) or wide angle (120°) hollow cone spray pattern in five different flow rates from 5 to 50 gpm. Thread connection for the smaller sizes is ⅜-in. male pipe thread, ½-in. male pipe thread for the larger sizes.

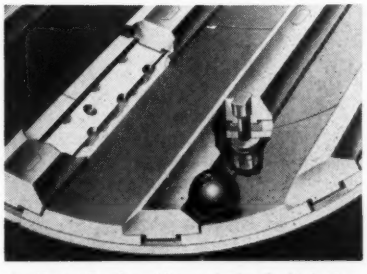
Rigid PVC Pipe

LIGHT and easy to handle, Easton Rigid (unplasticized) PVC Pipe is now available in all standard pipe sizes from ¼ to 6 in., according to Easton Plastic Products Co., Inc., Easton, Pa.

Lining for Grinding Mills

WITH RENEWABLE LIFTER BARS and patented abutment strips made from Oroloy steel, the Oro-Lok Lining for cement and ore grinding mills is said to offer considerably longer service than linings of the conventional type.

Abutment strips are welded to the



shell at the location of the bolt holes. These strips serve a two-fold purpose by strengthening the shell, and at the same time, holding the liners firmly in place.

Lifter bars butt against liner plates, which, in turn, butt against the abutment strips which absorb all lateral stress; thus bolts are subject to tension only. Oroloy, a high manganese steel, is alloyed and heat-treated to give lifter bars the toughness and hardness they need to withstand severe working conditions. Lifter bars are designed so they may be removed or reversed without disturbing the rest of the lining.

Further information may be obtained by writing to Kensington Steel Co., Chicago 28, Ill. (Division of Poor & Co.).

Motor Grader

A TORQUE CONVERTER model of the "660" motor grader has been announced by LeTourneau-Westinghouse Co., Peoria, Ill.

Designated as the Adams Power-

Flow 660, the unit has basically the same design features as the standard model "660" with the additional operational advantages of a torque converter drive train plus a 27-percent increase in engine power. The Power-Flow grader teams a 190-hp diesel power plant with a single-stage torque converter and four range constant mesh transmission.

Electro-Mechanical Control System

MECHANICAL AND PNEUMATIC SYSTEMS can be converted to d-c current for long range transmission and then reconverted to pneumatic pressure for actuating control valves or other pneumatic equipment.

Called the P-E-P transmission system, it is said to permit extremely low cost remote measurement, indication, recording and controlling of process variables by the elimination of electronics and complex circuitry.

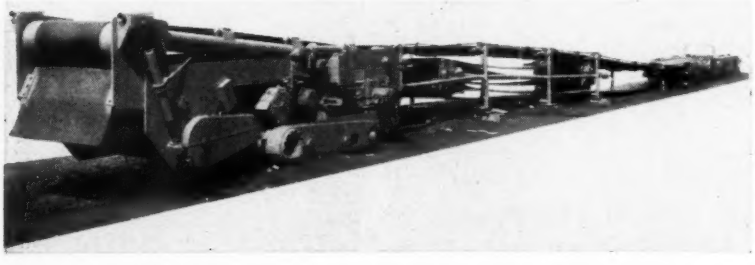
The transmitter unit uses a flexure-mounted beam and pneumatic nozzle as an error detector and power amplifier to convert a pneumatic signal to an electric signal. It converts pneumatic signals of 3 to 15 psi or equivalent mechanical outputs into 3 to 15 milliamperes d-c current for electrical transmission. A receiver, part of the P-E-P system, then converts this d-c signal to pneumatic pressure of 3 to 15 psi.

Additional data may be secured from Fielden Instrument Division, Robertshaw-Fulton Controls Co., 2920 North Fourth St., Philadelphia 33, Pa.

Belt Conveyor

AN EXTENSIBLE BELT CONVEYOR, 36 in. wide, has been developed by the Goodman Manufacturing Co., Halsted St. and 48th Place, Chicago 9, Ill.

In operation, the conveyor is linked to the discharge end of a continuous mining machine and can be extended in length while operating. As the mining machine digs its way into the coal seam, the conveyor extends its carrying length to keep pace while taking the coal that has been cut and loaded and moving it back to the out-of-the-mine transportation system. The only interruption during an advance as great as 1000 ft is the short time required to add belting to the conveyor after every 50 or 100 ft of forward progress.



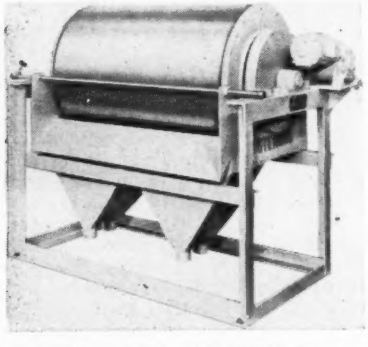
The tail section of the conveyor, which is connected to the discharge end of the continuous mining machine by a bridge conveyor, is mounted on tractor treads and is motor driven. As the operator of the continuous miner drives his machine forward into the coal beyond the reach limit of the bridge conveyor, a second operator drives the tail section forward. The belt needed for this extension is reeled from an arrangement of storage spools in an open frame attached to the head section at the other end of the conveyor. This section is also tractor mounted and motor driven but remains stationary during the full extension of the conveyor.

Belting rides on sets of three steel rollers hinged end to end and suspended at intervals between two taut paralled wire ropes running from tail section to head section. The wire ropes are supported by lightweight stands. As the belt is extended, rollers and support stands are added as needed without stopping the belt.

Ropex, as this conveyor is named, is presently available for application in 72 and 48 in. high coal seams.

Magnetic Separator

HIGHLY EFFICIENT RECOVERY of magnetic media in heavy media separation plants is said to be a feature of a new Stearns Type WPD Magnetic Drum Separator. Designed especially for recovery of magnetite or ferrosilicon media in coal and ore processing plants, the Model M separator produces a magnetic concentrate of high specific gravity, even from non-densified slurry feeds.



A permanent magnet assembly lifts out magnetic particles from the feed as it flows under a rotating drum. It is claimed that better than 99 percent of the magnetite from coal slurry or ferrosilicon from ores can be recovered automatically and economically.

For Bulletin 2011, describing the separator, write to Stearns Magnetic Products, a Division of Indiana Steel Products Co., 635 South 28th St., Milwaukee 46, Wis.

Emergency Lighting Unit

WEIGHING 37 LB with one lamp mounted on the case, a newly introduced emergency lighting unit operates automatically and instantaneously during failures of normal power and automatically prepares itself for the next blackout.

Immediately following an emergency discharge, the Model A Exide Lightguard automatically recharges its storage battery at a high rate. At the end of the high-rate charge, the Lightguard returns the battery to a trickle-rate to maintain itself in a state of constant readiness.

Designed for installation on posts or walls, the Model A Lightguard is available as auxiliary lighting equipment for plug-in connection to 115-v, 60 cycle a-c power sources. Also available is a Model AE for use as emergency lighting equipment for permanent connection to a-c power.

Further information can be obtained by writing to Department AL, Exide Industrial Division, The Electric Storage Battery Co., Box 8109, Philadelphia 1, Pa.

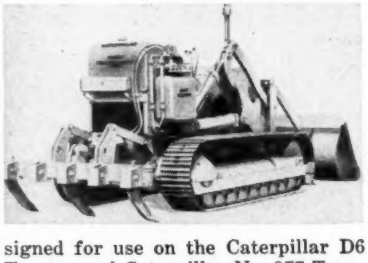
Bonding Rubber to Metal

REDUCED COST is claimed for a new system of bonding rubber to metal. Called Duolock, the system combines a Duolock primer with appropriate Duolock tie coats. It may be used on motor mounts, industrial tires, rubber covered rolls, printing and typewriter rolls or wherever rubber materials, both natural and man-made, are bonded to metal. Duolock primer is a free flowing, single phase, black liquid supplied at a viscosity of 95 centipoises with a solids content of 22 percent, suitable for brushing as supplied.

Samples, literature and prices of the Duolock system are available through the Adhesives Division of B. F. Goodrich Industrial Products Co., a division of The B. F. Goodrich Co., Akron, Ohio.

Rippers

TWO TRACTOR-MOUNTED rippers designed to speed bulldozing and loading operations have been announced by Caterpillar Tractor Co., Peoria, Ill. The No. 6 Ripper is designed for use on the Caterpillar D6 Tractor and Caterpillar No. 977 Traxcavator. The smaller model, known as the No. 4 Ripper, is designed for use on the Caterpillar No. 955 Traxcavator.



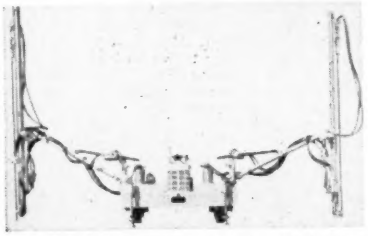
Three alloy steel teeth with replaceable tips are normally installed, but provision has been made for the installation of two additional teeth, should they be desired.

One of the outstanding design features, according to the manufacturer, is the parallel linkage which is used to maintain the same angle of penetration at all depths. The use of the type of linkage is said to permit good ripping action at any depth of tooth penetration in addition to protecting the hydraulic system by reducing cylinder pressures created while ripping.

Dual Drill Rig

A SELF PROPELLED DUAL DRILL RIG, the T286, reportedly provides one of the most variable drilling patterns yet attained in equipment of this type. It is manufactured by the LeRoi Division, Westinghouse Air Brake Co., Milwaukee, Wis.

Two seven-ft arms, mounted on swivel heads, allow an arcing of the arms which provides a drilling pattern with a 24-ft spread. Radius of turn of each arm is 220° from the mounting posts. This variable drilling pattern



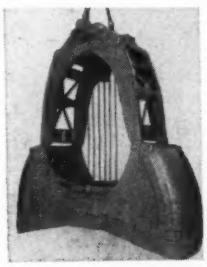
from one sitting reportedly eliminates tractor positioning after drilling each set of holes. Upward and downward positioning of the arms is done by an air motor.

The drill rig may be purchased with one or two LeRoi-Cleveland air feeds mounted on a crawler tractor powered with a 28-hp gasoline engine. Diesel engines are also available in the tractor.

The T286 has the heavy-duty DR40 feed, which has a ten-ft travel and eight-ft steel change as standard equipment. Various size steel changes are available. The DR40 feed allows the use of either the D25DR or the D14DR drifters; the former is a 3½-in. drifter, while the latter is a four-in. unit.

Device for Grab Buckets

JAMMING AND BREAKAGE of gear-type alignment devices, common with grab buckets handling noncrushable materials, is entirely eliminated by a link-type hinge alignment device, according to Mead-Morrison Division of the McKiernan-Terry Corp., Harrison, N. J.



Developed for use on buckets handling slag, ore, and other hard materials, the device reportedly has a great deal more bearing surface than an ordinary gear-tooth engagement and is entirely enclosed. It is fabricated entirely of Carillory T-1 steel and is available only on Mead-Morrison buckets. Operation is by the interaction of a linkage of T-1 steel plates that replaces entirely the gear-teeth of conventional hinge alignment devices.

— *Announcements* —

Marion Power Shovel Co. announces a reorganization of the firm's service department and personnel changes within the department.

R. P. Sullivan is promoted from service manager to manager of service and erection, a new position. **C. S. Jarvis**, former assistant service manager, assumes the duties of service manager, while **L. D. May** and **James S. Hotz** are assistant service managers.

The election of **Roy T. Hurley** and **Richard K. Paynter, Jr.**, as directors has been announced by J. R. MacDonald, chairman of board and president of **General Cable Corp.**

Dorr-Oliver Inc. has announced several recent staff promotions in the Filtration Technical Division, located at Oakland, Calif., which is responsible for the development, engineering, design and cost estimating of all D-O filtration equipment.

Dwight Richards has been appointed assistant director of the division under **E. L. Oliver, Jr.**, vice-president and director of this technical division. **Graham Lee**, former engineering supervisor of Specifications and Standards, has succeeded Richards as manager of Filtration Engineering.

Walter J. Riker has been named manager of Filtration Product Development upon the sudden death of **Philip J. McGuire. Harry B. Dempsey** has been promoted to the post of supervisor of estimating for the Filtration Technical Division with the retirement of **Harry E. Krayenbuhl**, long-time head of Filtration Estimating.

Carboloy Department of **General Electric** has been renamed the Metallurgical Products Department. The new designation was chosen to reflect the company's emphasis on speciality metals development and manufacture.

George D. Becker has been appointed special design consultant for the Crusher Division of **Nordberg Manufacturing Co. He** will make his headquarters at the company's main office in Milwaukee, Wis.

Acme-Hamilton Rubber Mfg. Corp., Trenton, N. J. announces the appointment of **William McNeil** as manager of its New York district sales office. McNeil was formerly associated with Harnischfeger Corp. for eight years as sales engineer covering New York and New England territories, and prior to that with Gates Rubber Co. as a sales engineer in its Boston territory.

The elections of **John A. Thornton** as secretary and treasurer and **Lewis H. Bethel** as assistant secretary and assistant treasurer of **Kennecott Wire and Cable Co.** have been announced by Alan F. Sheldon, president. The wire and cable company is a subsidiary of Kennecott Copper Corp.

Ohio Brass Co., Mansfield, has announced the election of **George L. Draffan** to the new post of chairman and chief executive officer. **Roger A. Black** was elected president to succeed Draffan.

D. E. Alworth has been appointed a service engineer for the Rocky Mountain region of **Allis-Chalmers Industries Group** with headquarters in Denver.

Mining and metallurgical laboratories of **The Dow Chemical Company's** Technical Service and Development group have been transferred from Pittsburg, Calif., to Dow's headquarters in Midland, Mich.

Location of the Mining and Metallurgical section at Midland will permit closer liaison with the company's other research and development groups.

CATALOGS & BULLETINS

TRAVELING PAN FILTER. *Dorr-Oliver, Inc., Barry Place, Stamford, Conn.* Leaflet No. 8001 describes the features, operation, advantages and sizes of this type filter. Also included are a typical layout diagram and several equipment and installation photographs. Designed specifically for handling strong phosphoric acid, the D-O TP Filter is a vacuum filter of the horizontal endless belt type. It consists essentially of a series of individual filter pans mounted on an endless rubber belt driven by sprockets. In operation, feed is distributed evenly across each pan. As the pans move forward, vacuum is applied through slots in the rubber belt, drawing filtrate into a collecting trough which may be divided to collect as many as 12 individual filtrates.

MOTORS. *Allis-Chalmers Mfg. Co., 972 S. 70th St., Milwaukee, Wis.* Bulletin 53B8424 describes d-c motors, ½ through 200 hp, and motor-generator sets up through 200-kw output. It covers shunt and stabilized shunt wound, compound wound and series wound motors in eight different enclosures plus a matching line of motor-generator sets for conversion of a-c to d-c current.

GRINDING MILLS. *Nordberg Manufacturing Co., Milwaukee 1, Wis.* Bulletin 232 describes Nordberg's complete line of grinding mills—rod, ball, pebble, tube and compartment type mills with grate, overflow or peripheral discharge. Nordberg grinding mills range in size from 8½ to 13 ft in diameter and up to 50 ft in length. They are built to meet

(*Continued on next page*)

(*Continued from page* 95)

specified conditions for wet or dry grinding in the manufacture of cement, the fine reduction of metallic and non-metallic minerals and numerous other processes where friable material must be comminuted to fine sizes.

DOLLAR SAVINGS THROUGH STANDARDS. *American Standards Association, 70 East 45th Street, New York 17, N. Y.* Proof of the value of standardization in the mining and conveying machinery field is stressed in this survey report which highlights economic benefits to American industry resulting from the use of standards. The 40-p. report, an up-to-date version of the original edition of 1951, contains 79 documented case studies covering 27 industrial fields.

MOTOR DRIVES. *Advertising & Sales Promotion Dept., Worthington Corp., Harrison, N. J.* Motor drives with positive pulley adjustment, ranging from ½ to 25 hp, is the subject of Bulletin No. 1610-B1 P. The bulletin contains information on how to select variable speed drives to meet any specialized requirement. It describes engineering features, remote controls, separate motor drive, and other Worthington mechanical power transmission products available.

SPRAY LUBRICATION EQUIPMENT. *The Farval Corp., 3249 East 80th St., Cleveland 4, Ohio.* Bulletin No. 60-A provides information on Farval spray lubrication systems for open gearing and slide surfaces. It offers descriptions of manual and automatic systems and component equipment with schematic layouts as well as actual application views.

ONE-USE DRILL BITS. *Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.*

A description of LeRoi-Cleveland one-use drill bits, their construction, specifications, and the preparation of drill rod shanks is given in Bulletin RD29. Photographs and drawings are used to illustrate the offset gauge, thinner wings, and steeper reamer angle of the one-use bits. The principle of the patented connection which is said to provide a firm union between bit and steel is also explained. Recommended heat treating procedures and gauging of shanks are given.

SKID-SHOVELS AND ATTACHMENTS. *International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.* Six pieces of literature on International Drott Skid-Shovels and attachments have been made available. Catalog K-656 covers the entire International Drott line, with on-the-job photos showing units utilizing various attachments, and diagrams illustrating the latest improvements. Other literature includes catalog A-100, describing the several sizes of log and pulpwood Skid-Grapples available; booklet A-200, covering grubber blades; sheet A-400 on the Bullangledozer blades; sheet A-500 on rock forks; and sheet A-300 on scarifiers.

SEPARAN 2610 IN THE COAL INDUSTRY. *Technical Service & Development, The Dow Chemical Co., Midland, Mich.* Describing specific uses of this flocculating agent, the technical manual draws special attention to the wide range of applications for Separan 2610—a synthetic, organic, water-soluble, high molecular weight polymer—in the coal industry. Also discussed are preparation of Separan 2610 stock solutions, methods of application, shipping and storage instructions, typical installations and related topics.

COMPRESSOR TROUBLES. *Merchandising Sales Dept., Worthington Corp., Harrison, N. J.* Bulletin PC-509P will help locate and correct common air-cooled and water-cooled compressor troubles. A cartoon sequence pictures a full description of compressor troubles—from failure to deliver air to excessive oil consumption.

VIBRATING SCREEN. *Allis-Chalmers Mfg. Co., 972 S. 70th St., Milwaukee, Wis.* Construction features of Allis-Chalmers vibrating screens, Model SH and Model XH, for handling feed up to 6 and 20 in. and coal up to 8 and 24 in., respectively, are described in Bulletin 07B6151D. It carries information on how to select a vibrating screen and provides general rules for cable suspended screens. The bulletin also tells of specially built screens for applications where standard screens cannot be used and of such auxiliaries as the Sta-Kleen deck and the Thermo-Deck heating unit which eliminates blinding; the pool washing deck, the automatic start and stop control, and screens for handling hot materials.

FLUID DRIVE. *American Blower Corp., Detroit 32, Mich.* Utilizing photographs, installation type drawings and rating charts, Bulletin No. 9719 describes the Size 126 Type T Gyrol Fluid Drive for general industrial use with electric motors and internal combustion engines.

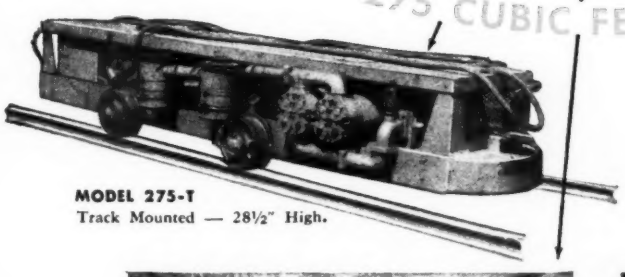
Index to Advertisers

ACME MINE COMPRESSORS–

Rugged • Dependable • Maneuverable • Self-Contained

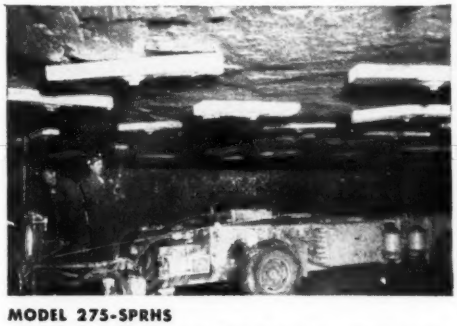
...and VERSATILE

275 CUBIC FEET OF AIR



MODEL 275-T
Track Mounted — 28½" High.

MODEL 275-S
Low Coal Special — 29" overall — Less if it is to be mounted in a carrier.



MODEL 275-SPRHS
Rubber Mounted — Self Propelled. Two stoper Jumbo Arms with stopers and dust collectors — 34½" high with 9" ground clearance.

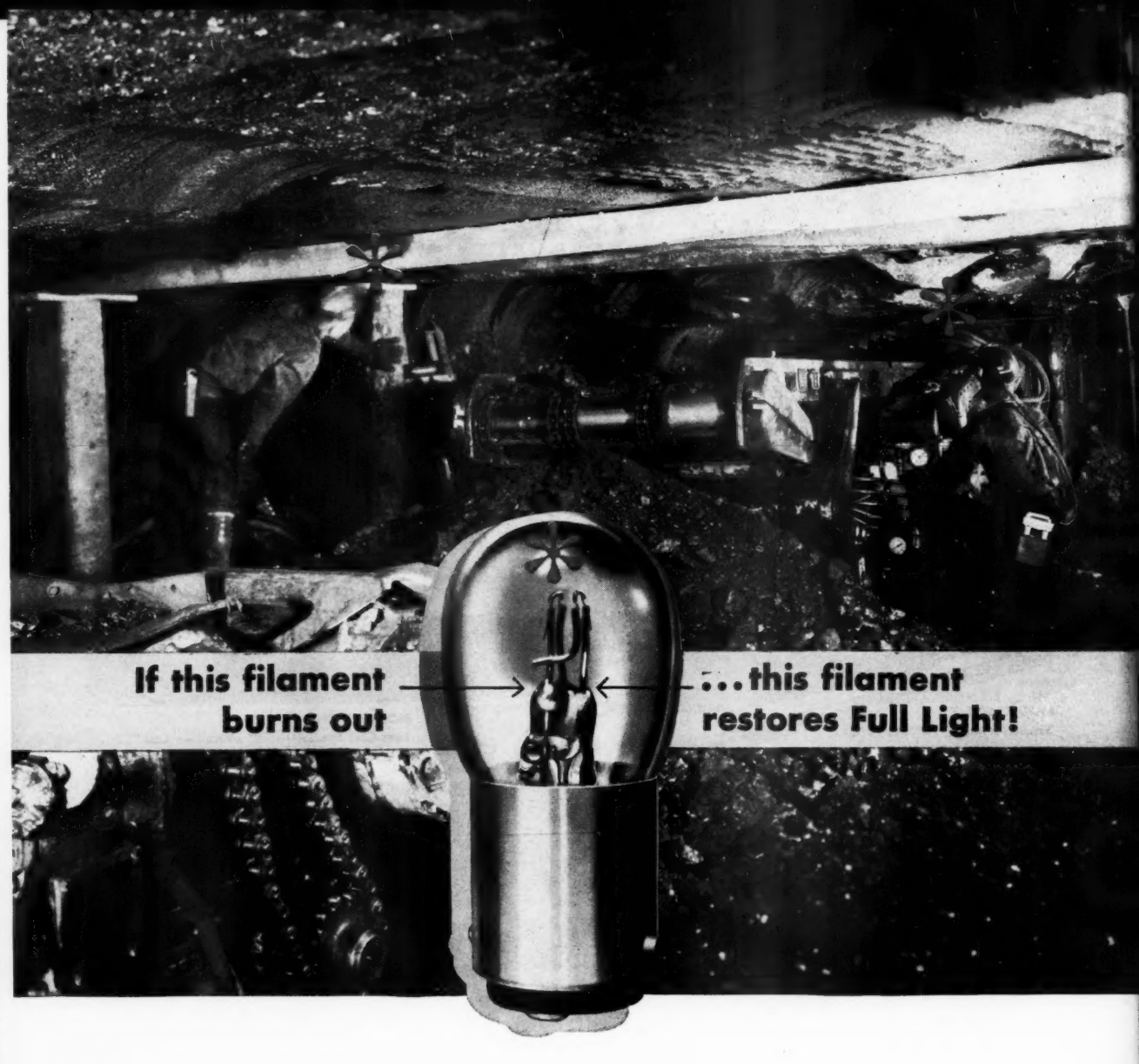
MODEL 275-TD
Track Mounted — 2 Drifter Jumbo Arms and Heavy Duty Drills for Rock Work. Arms may be interchanged with stoper Jumbo Arms.

One of these machines will fit YOUR mine conditions.
Variations such as with or without cable reels, variable ground clearance, seats, etc. are available. Full hydraulic drive and steering. Parking and tramming brakes.

Write or call us and let us quote on your requirements —
We will be glad to demonstrate in YOUR mine.

ACME *Machinery Company*

WILLIAMSON, WEST VIRGINIA



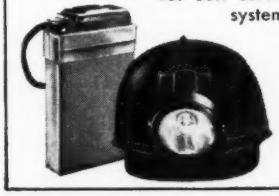
Man-hour protection for working crews . . . the Edison R-4 double-filament bulb

This working crew enjoys greater underground safety, more productive man-hours because the Edison R-4 double-filament bulb is on the job.

Miners equipped with this bulb know that burn-out doesn't mean blackout. If one filament burns out, a turn of the switch transfers the power of the unfailing Edison battery to the second filament—continued, brilliant illumination is restored for the full shift. There's no lost time for the miner, or short crews for the foreman. There is only *one bulb*, located in the center of the headpiece, which gives the advantages of maximum reflector area.

This kind of reserve light protection means that hundreds of man-hours may be saved every year. The result is increased production with an added margin of safety. Our bulletin gives complete details. Write for your copy.

Edison R-4 Cap Lamp . . . ideal for self-service systems.



MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

ulb

ideal
ervice
stems.